THE AMERICAN SCHOOL AND UNIVERSITY

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

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Foreword

By EDWIN C. BROOME

Superintendent of Schools, Philadelphia, Pa.; President, Department of Superintendence, National Education Association

CAREFULLY planned modern school buildings are designed to express a new educational philosophy. This philosophy, in brief, means that education today is intended to raise the level of intelligence of the entire community, from the smallest children to the oldest adults, and to furnish opportunities for the development of all phases of intellectual aspiration. Education today must be all-inclusive, and must be so planned that it serves the needs of all types in the community. This is what democracy means if it means anything, and democracy must pay the price. The up-to-date, well-equipped school buildings which we see in every progressive community in America are not the result of the ambition and imagination of schoolmen so much as they are the expression of the aspirations of the community.

The American School and University furnishes information well arranged and well illustrated, not only for those who plan and build school buildings, and for those who select and purchase equipment and supplies, but also for the superintendent who is expected to advise his board upon the matters of school planning and equipment. Such a book renders valuable service to every school community which is endeavoring to furnish its children with the best educational opportunities. No other publication comprises between two covers such an abundance of useful material on the subject of school buildings and equipment.

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Section I

BROAD PROBLEMS OF EXPANSION AND ECONOMY

The Educational Consultant in School-Building Planning

How His Services Can Be Made of Maximum Value to School Boards and Architects

BY N. L. ENGELHARDT

ASSOCIATE DIRECTOR, DIVISION OF FIELD STUDIES, INSTITUTE OF EDUCATIONAL RESEARCH, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

NOTEWORTHY progress has been made in the planning of school buildings and in the development of the public school plants of the cities of this country. The "hit or miss," "trial and error" programs of a few decades ago have been replaced by administrative activities based upon carefully accumulated evidence and upon scientifically formulated principles of planning.

Little Progress from 1880 to 1900

School buildings erected in many parts of the United States during the period from 1880 to 1900 showed very little growth in their adaptation to educational needs. A school built in one part of the country and admired for its architecture was frequently duplicated in many other parts of the country without consideration as to whether or not its space permitted the adequate housing of the educational program. To be sure, the educational program was only beginning to emerge from its complete domination by the narrow restrictions of the classical college requirements. Architectural effort during this period was satisfied in many cases with reproducing the prevailing state capitol or courthouse style of architecture, with slight modifications for educational needs.

Such structures were found to be most unsatisfactory for educational use, and have for a number of years been utilized with great reluctance by the professional personnel who have been obliged to teach in them. Because of the cost of these buildings it was often necessary to make use of their huge cavern-like basements, which were damp, dark and poorly arranged for the uses to which they were put. Buildings of this type are also likely to have huge auditoriums, under roof spaces with inadequate and unsafe approaches; classrooms ill-shaped and insufficiently provided with natural lighting; excessive corridor spaces in the dark interiors of the buildings; and laboratories tucked away in congested quarters.

The Contribution of School Surveys

In the decades following 1900 the school survey movement, with its analysis of the educational plant, brought to light the many defects which were being incorporated in school buildings. The early surveys of school plants were widely read and extensively commented upon at educational meetings and in educational periodicals. They also served to focus the attention of school architects and school planners upon building and site standards. These surveys frequently carried illustrations of defects in schoolhouses, as well as the desirable characteristics which had been discovered in local school systems. As the century advanced and educators began to adapt the curriculum to child needs instead of adjusting children to the curriculum, the architectural profession found that school buildings could be planned only after a full consideration of educational progress and only with the advice and assistance of the trained educator.

Many surveys of school plants have been made by educators in all parts of the country,* and definite standards for school buildings have been developed for the guidance of architects and school boards. These standards are constantly in the process of correction. The survey movement and the development of standards have aided significantly in the contribution which educators have made to building planning.

The Architect and the Consultant Cooperate

Many years of cooperation between school architect and educational consultant have demonstrated that better and more adaptable buildings may be planned, many dollars of original construction cost may be saved, and economy may be effected in

* Engelhardt, N. L.: "School Building Programs in American Cities."—Bureau of Publications, Teachers College, Columbia University, 1928.

the ultimate operation of plants when these two fields of service unite in the study of school plans and in the adaptation of school plans to local needs. This combination of architectural and educational knowledge has resulted in the advancement of school-building planning to the point where school buildings in many cases in the United States are better adapted to their purpose than are buildings of any other character.

The Necessity of a Planned Program

Architectural service is thought of with specific reference to one building, while educational service must consider the population needs and population development of a community; the future and existing utilization of buildings; educational trends; desirable locations for buildings of each type to be found in the subdivisions of the edu-

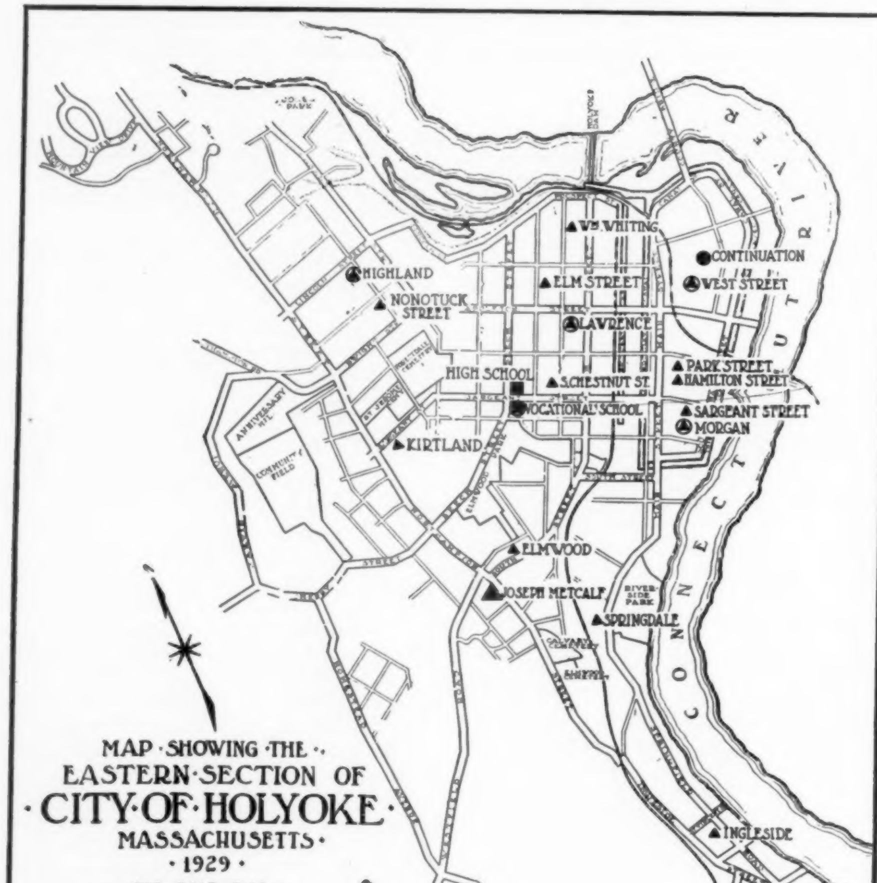


FIG. 1. HOLYOKE'S PRESENT SCHOOL FACILITIES

Of the nineteen school plants here shown, twelve are elementary schools, three are elementary-junior high schools, one is a continuation school, one a junior high school, one a four-year high school unit, and one a vocational school which is housed in the high school gymnasium. Instead of the twenty separate units, the survey proposes that there should be in 1940 only thirteen different units. This means the ultimate elimination of many of the present inadequate buildings.

cational organization; and the determination of what each building must include. Volumes have been written on the preliminary work which must be done on the educational side before even the initial sketches are thought of for a particular school building.* A perusal of these texts indicates the growth of techniques and procedures which are of primary importance in the ultimate planning of a schoolhouse, but which are of only secondary interest in the mind of the architect himself.

FIG. 2. HOW THE ELEMENTARY SCHOOLS MAY BE LOCATED

On the completion of the ultimate program for elementary schools in the city of Holyoke, the total number of buildings needed will be only nine instead of the large number shown in Fig. 1.

* Moehlman, A. B.: "Public School Plant Program."—Rand, McNally and Co., 1929.
Engelhardt, N. L., and Engelhardt, Fred.: "Planning School Building Programs."—Bureau of Publications, Teachers College, Columbia University, 1930.

The Survey of Holyoke Schools

The experience of many communities of varying sizes has led to the conclusion that preliminary planning is necessary when building needs are felt, regardless of the size of the community. The survey which has been made of the schools of

Holyoke, Mass.,* may be used as an example. This survey has brought to light the past failure to plan adequately to meet the school-building needs of this commercial center. Fig. 1 shows the nineteen school buildings of Holyoke at the time of the survey in 1930. One of the schools does not appear on this map.

A School-Building Program Developed

In the school-building program developed as a result of the survey study, it was proposed that in 1940 there should be only thirteen different units instead of the twenty existent separate units. Some of the gross inadequacy of past planning may be seen by the location in Fig. 1 of the Park Street School, the Hamilton Street School, the Sargeant Street School and the Morgan School, all within a relatively short distance of one another. As a result of this past planning, three of these buildings can be given no important part in the future program of the city.

Figures 2 and 3 show the proposed ultimate locations for elementary schools as well as junior and senior high schools. The city of Holyoke is now advancing its school-building construction in terms of these accepted proposals. The net result will be better school buildings on more adequate sites, as well as buildings which are placed with due reference to the needs of all the population.

How the Consultant Helps the Architect

The determination of the school-building program, the selection of school sites, the ascertainment of optimum sizes for buildings as well as classes, and the decision with respect to the kind of building to be erected on each site, are distinctive phases of the educational consulting service which is being rendered boards of education. The architect is relieved of responsibility in these fields, and is provided with a proper setting for his work, namely, an adequate site and a complete definition of the educational needs to be met in the building which is to be erected. The architect thus secures the opportunity to plan a building which may express the dignity and character of the educational program to be housed therein.

A Schedule of Room Space Needed Is Prepared

After an architect has been chosen by a board of education to develop plans for a specific building, the general type and character of the building will of course be defined. Conferences in which the architect, the educational consultant and the local school authorities participate will be necessary to clarify many details of the planning. Previous to these conferences the educational consultant must have analyzed the room schedule needs, and he must have worked out a complete statement of the room spaces required. This statement will be based upon the length of class periods and the number of class periods proposed for the school day. The consultant must be familiar with the educational trends for the various types of subjects, and be prepared to indicate the percentages of pupils who will take the various types of subjects during the different stages of enrolment increases.

Specialized Layouts Are Provided

The experience which the educational consultant brings to his conferences with the architect and the local school authorities should include extensive analyses of existing school buildings. This experience should enable the consultant to determine the most satisfactory layouts for various types of rooms and to associate layouts definitely with the character of the educational program to be promulgated. All the rooms of a school building today are becoming special rooms, whether they are the spaces devoted to academic recitations, to physical education, to shops or household arts, to administrative purposes, or to classroom work itself.

Specialized layouts indicating the size of rooms and the character and placement of equipment are particularly helpful to architects at this stage of their planning. These specialized layouts also enable the teacher, supervisor, principal and superintendent to participate to a maximum degree in the planning. At this stage of the work the criticisms of the local participants in the educational work should be encouraged. The architect is saved drafting time and his own planning time if these decisions are made at an early period. Not only should the architect be provided with layouts which indicate the character of the spaces, but definite information should be given him with reference to the relationship of spaces to one another.

Consultations Facilitate the Development of Plans

Subsequent to the development of the preliminary plans, the architect and the educational consultant will have many conferences over the plans themselves, and will discuss with reference to educational needs the character of the materials to be used for the floors, walls and ceilings of the various kinds of rooms. By the time the architect moves to his working drawings and the writing of his specifications, all differences of opinion will be ironed out, and all the individuals involved in the planning will come to a complete agreement conerning the details of the building to be erected. It is safe to assume that such planning will eliminate unusable space and will produce a building most suitable for the proposed educational program.

Justifying the Community's Investment

As the cooperation between architect and educational consultant is more fully extended, and as the educator succeeds in reducing to space

* Strayer, G. D., Engelhardt, N. L., and Others: Report of the Survey of the Schools of Holyoke, Mass.—Division of Field Studies, Institute of Educational Research, Teachers College, Columbia University, 1930.

relationships the needs of the educational program, the character of our school buildings throughout the nation will be increasingly improved. The school executive is constantly confronted with the problem of securing the utmost from every dollar spent on the school plant. The architect chosen for a school structure assumes the burden of making a significant and dignified architectural contribution to the community which he serves. The welding-together of the concepts of architect and educator so that the community's investment is justified is the fundamental problem in school-building planning. During the next twenty-five years school-building planning should undergo such a significant advance that a minimum of error will be possible, and a maximum of pride and satisfaction will rest with those who participate in any phase of such planning.

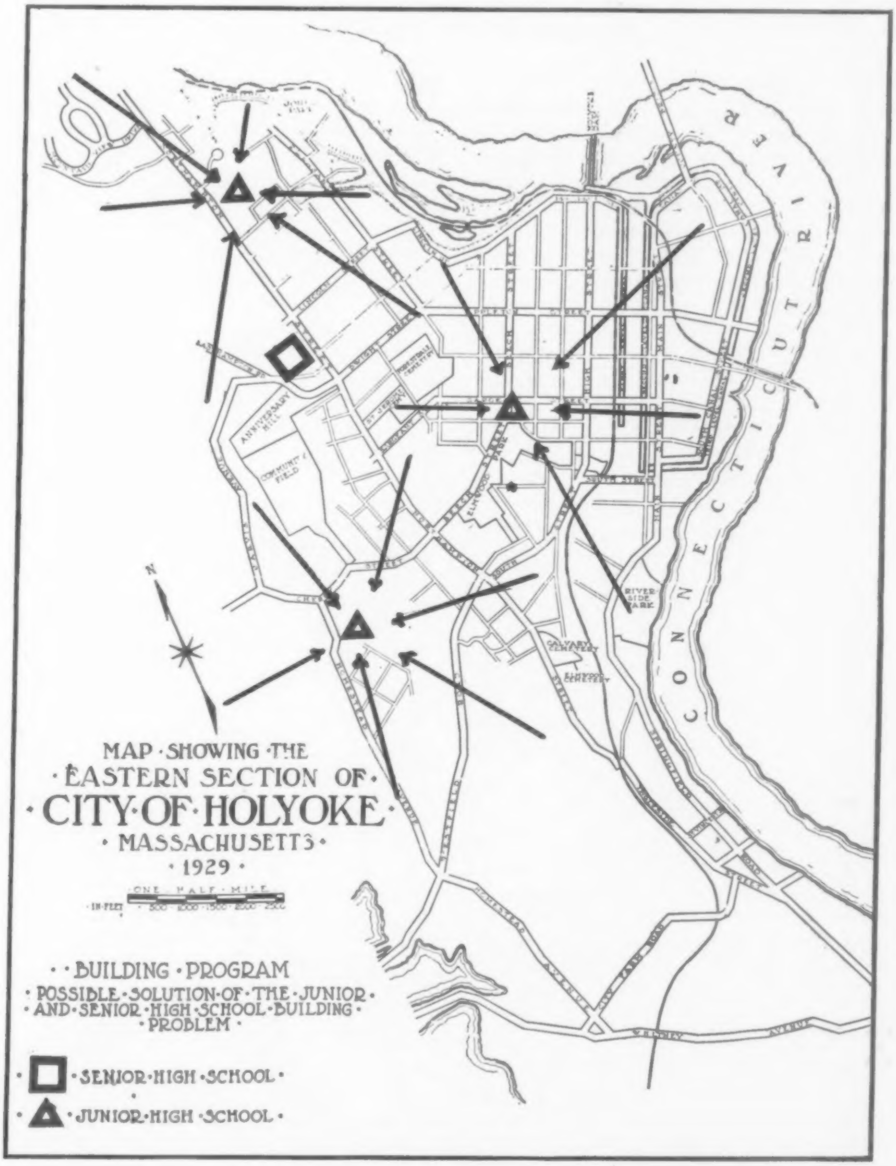


FIG. 3. THE PROPOSED SENIOR AND JUNIOR HIGH SCHOOLS

The senior high school is so located that as the city spreads to the west it will serve the population for a long period

A Replacement Program as Measured by Depreciation

BY GEORGE STEPHEN MURRAY
NEW HAVEN, CONN., PUBLIC SCHOOLS

A SCHOOL system should receive annually sufficient funds to cover the costs of rendering educational service. One of these costs is for depreciation, from whatever aspect that term may be considered. No matter how a depreciation allowance may in actual practice be tied up with such other procedures as repairs, replacements, capital outlays, interest or imputed rental charges, it ought to be recorded and reflected in the annual charge for education.

Three Aspects of a Depreciation Allowance

To be completely understood, a depreciation allowance should be considered from three aspects:

1. *The Utility Aspect.*—The allowance measures the value of the expended utility of the property. The property is seen as gradually losing its usefulness. When a point is reached below which use is not possible or desirable, or when conditions have changed to render the property inadequate, the service life of the structure has ended and it must be replaced. The amount of the allowance, therefore, sets forth the decrease in service potentiality.

2. *The Physical Aspect.*—A valuation is also set upon the physical decline of the plant. Both the physical and utility aspects may involve the question of the cost of replacement.

3. *The Financial Aspect.*—From this point of view a depreciation allowance is the expression of the value of the decline as a cost of educational service, which should be included in the annual expenses. It is also a plan for recording the amortization of the original capital investment, and it may provide financial capital with which to replace the property when abandoned.

Distributing the Burden of Replacement

Unless provision is made yearly for the decrease in value of each unit, and a fund accumulated which will provide for replacement when necessary, new property built or acquired must be paid for in either one of two ways, in neither of which is there any equality of distribution of the burden: (1) the property is regarded as a gift to posterity, and is paid for on acquisition from the revenues of the acquiring generation; or (2) the matter of payment is shifted, by means of bond issues, to future generations, which may not have the use of the structure, even in a deteriorated condition, should they wish to use it. Educational requirements are changing rapidly, and the school is housing activities not dreamed of a few years ago. New plants must be developed to be readily adaptable to situations now only dimly envisaged. In order to meet this need, the financial plan must also be of a flexible nature.

The Basis of an Allowance

An annual depreciation allowance must be based on the various items which work together to cause lessened efficiency. Normal physical and utility losses through time, nature and use, together with the possible factors of inadequacy and obsolescence, enter into the determination of the expected service life of the plant. In calculating the financial value to be set upon this lessening of efficiency, there must be constant adjustment to include additional capital outlays.

The allowance may be in the form of an actual fund to which installments are added each year, or it may be an accounting credit which permits the money to be used for other purposes until needed for specific replacements. Theoretically, at the abandonment of a unit, the fund should be of exactly the amount necessary to replace the unit with construction of equal capacity or utility. It is not necessary that the same facilities be provided; they may be in a changed form to comply with the latest theories and methods. Replacements may be delayed until needed, or the financial equivalent may remain in the fund until required. Under such a plan care must be exercised in the accounting records to differentiate between *replacement* of present facilities and *increases* in capacity, even though the accumulating fund may actually furnish the cash.

The Way the Plan Works

To take an example: The buildings of a school system are valued at **$1,000,000**, and perform a standard type of service for **5,000** children. Using an annual charge for depreciation of 4 per cent of cost, there would be provided **$40,000** yearly for replacements. The condition of one school becomes such that abandonment is desirable. New additions are to be placed on other schools or a new building is to be erected in another section of the city to absorb the work done by the abandoned school. The amount credited to the depreciation account for the old building is withdrawn and applied toward the cost of the new construction. If the new facilities take care of more children or give a more costly type of service, the excess cost must come as increased capi-

tal investment. Should this increase amount to $100,000, the annual depreciation allowance hereafter will be $44,000.

The Advantages of a Revolving Fund

Since most school systems have buildings in various stages of age and usefulness, the depreciation fund may act as a revolving fund to provide the money necessary for all new buildings and additions. This practice meets the objection to the creation of idle funds. The actual cash in the fund might be steadily in demand for new construction, but by accounting procedure the depreciation account shows as a credit the total amount of depreciation allowance on all existing buildings. In this way the fund is constantly in use for building purposes.

A further development of the idea of spreading the burden would be to enlarge the percentage of the annual allowance so as to include the average cost of repairs and to use the fund for that purpose also. It is readily seen that the later years of the life of each building bring the heavier repair costs. As in straight depreciation, the pooling of charges eases and spreads the burden.

Other Kinds of Depreciation Allowances

While this plan has heretofore referred entirely to building depreciation, there is another field in which it might be used with even greater frequency. That is in providing for the replacement of furniture, furnishings, equipment and similar items. These are constantly being replaced in most school systems, and any of the variations of the financial aspects of replacement enumerated previously can be used successfully to provide funds for their payment.

Depreciation and replacement are facts which must be faced. Depreciation is accruing annually and should so appear in the cost records. Replacement ought not to be subject to the whims of municipal legislative appropriations or election referendums, but should be planned for in a well-conceived program which provides for what is needed when it is needed.

The Expansion of Small Colleges

BY DWIGHT JAMES BAUM
ARCHITECT, NEW YORK CITY

RECENTY a well-known university president made the statement that there are only eight real universities in this country. He did not mention colleges, however, for while he may question the standing of some of our universities, he cannot deny that there are many small colleges doing excellent work. More than a few, of course, lead a hand-to-mouth existence and are not able to retain an able faculty. For this reason and because of inadequate equipment, they do not add greatly to the knowledge of the younger generation. In contrast, however, a number of small institutions exert a real influence, not only in their own communities, but over a large area.

Many of these small colleges are now expanding both their staffs and their equipment. Some

Dwight James Baum, Architect

AN ARCHITECT'S DRAWING OF THE NEW ADMINISTRATION AND ARTS BUILDING PLANNED FOR WELLS COLLEGE, AURORA, N. Y.

of them still offer the advantage of close personal contact between the faculty and the student body, and by their convenient locations make possible the college education of young people who might not otherwise be able to afford such study; some of them are very successful and their expansion is the result of a real demand made upon them by a larger enrolment.

Three Types of Expansion Programs

This article will describe three different expansion programs, which involve problems fairly typical of those confronting other small but growing institutions. The first program to be discussed is that of a college firmly entrenched on the only available site in the community. Expansion must be worked out on the existing campus. In the second case, a college has had an entirely new site made available, necessitating removal of the institution to a new community, where a complete new plant must be built up. A departure of this kind is generally the result of an offer of financial aid if the institution will move to a certain city. The third type of expansion program to be outlined is that of a college which finds it impossible to add to its present buildings and which has no campus or surrounding space to build on. It must acquire a new site in the same community.

The three colleges to be described, Wells, Hartwick, and Clarkson College of Technology, are all situated in central New York State, within 300 miles of each other. Old brick classical and new Colonial buildings predominate in the region, and the same early American type of architecture will be adapted to the new buildings planned for the three institutions.

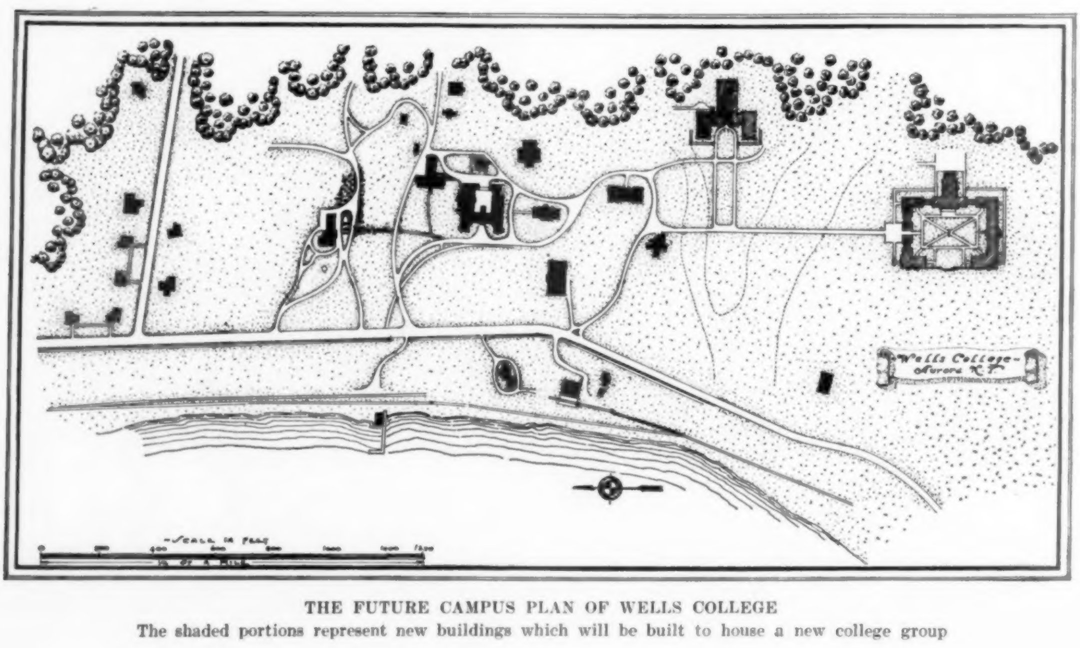
Expansion on the Existing Campus at Wells

Wells College, at Aurora, N. Y., illustrating the first type of expansion mentioned, is one of the oldest colleges for girls in this country, having been founded in 1867 by Henry Wells of the Wells-Fargo Express Company. From the beginning the enrolment constantly increased, until a few years ago it became impossible to accept any more students because of a lack of classrooms and living quarters. The present campus, like that of most of our older colleges, is composed of a miscellaneous collection of buildings of different periods and different character.

The institution finds it impossible for financial reasons to alter the present buildings, so in considering a plan of expansion it was finally decided, after many conferences between the faculty, trustees and architect, to utilize a site at one side of the present group of buildings for a general Administration and Arts Building, which will eventually be the center of the greater institution. This new central building, which is now being planned, includes not only executive offices, but also space for certain arts courses, a small university museum and a general college auditorium and theater, adequate to accommodate the entire future membership of the institution.

Separate Colleges to Be Maintained

It was decided to retain the present enrolment of slightly under 300 girls as a single college group, and to build a new college group for from two to three hundred girls, on the further side of the new central administration building. This, of course, is following along the lines of the new Harvard and Yale quadrangle plan. It has been



THE FUTURE CAMPUS PLAN OF WELLS COLLEGE
The shaded portions represent new buildings which will be built to house a new college group

Dwight James Baum, Architect

A VIEW OF THE PROPOSED CAMPUS OF HARTWICK COLLEGE, ONEONTA, N. Y.

found that with a group of approximately 250, the students have an opportunity to meet and know each other. It is possible to make personal contact in such a group which would be more difficult with a larger enrolment. It is also possible to maintain a certain rivalry in student activities among the different college groups.

It will seem, of course, upon completion of the Administration Building, that it is not central and accessible to all parts of the present college. The location is logical, however, in view of the way the college will expand. The present criticism will be forgotten as the plans for the greater institution will develop. The new dormitory quadrangle unit will be designed along similar lines, giving complete social and living quarters for over 200 girls. They will, however, work together in classes and laboratories with the girls from the older or present group of buildings.

An Entirely New Campus for Hartwick

A different expansion problem confronted Hartwick College, the oldest Lutheran institution in America. It was founded in 1812 as Hartwick Seminary, and until three years ago remained in a small town of the same name, a few miles from Oneonta, N. Y. Many years ago the seminary ceased to be just a teaching school for Lutheran ministers and started carrying several arts courses. The old equipment was not adequate, and when, three years ago, the citizens of Oneonta raised a fund of several hundred thousand dollars and also provided a site for a new campus, the institution moved to Oneonta and obtained a charter for general college courses.

Connecting Buildings Planned

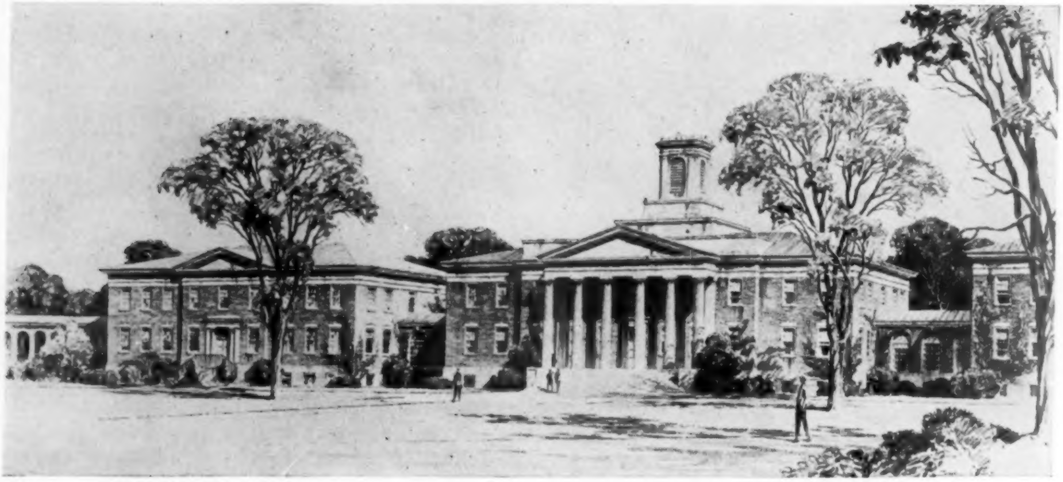
The large hillside plot which was presented to the college was carefully studied by the architect, and a general plan was agreed upon for the complete future development of the institution. As shown by the illustration, the plan embraces a combined central administration and chapel building, a hall for arts courses and a hall for sciences on either side, a gymnasium building at one end convenient to a possible athletic field, and balanced on the other side by a library near the arts building. In front of both the gymnasium and the library, at a lower level, are dormitory buildings, the one for women in front of the library, and the men's in front of the gymnasium. It is expected that if the institution continues to grow as it has during its first few years, it will be necessary to build more dormitories, although many of the students partly support themselves during their college course and live in the city.

One Building Completed

The Hall of Science was erected in 1929 and is now being used. It was necessary to plan this building so it could house most of the college activities at the beginning and yet could be altered with the least possible expense after the other structures were erected. At the present time the college enrolment is as large as possible with the available equipment. The trustees hope to build two other buildings at an early date to supply the much-needed facilities. This group of buildings has been very carefully studied to make the most of a picturesque yet difficult site; the buildings have been planned to be both economical in cost and attractive in appearance.

A Nearby Estate Bequeathed to Clarkson

Clarkson College of Technology, at Potsdam, N. Y., one of the older small engineering schools, has received support from successive generations of the Clarkson family. The present group of stone buildings is in the center of the town, making it impossible to develop a campus or add to the present equipment without tearing down existing structures in a fine old residential district. Recently, one of the Clarkson family died and left the college a beautiful estate on the edge of the town, extending to the Raquette River. The grounds are partly wooded and are ideally situated, making a beautiful site for a group of college buildings. Again the problem was studied with the future in mind, and a plan was made which will take years to carry out. In fact, one

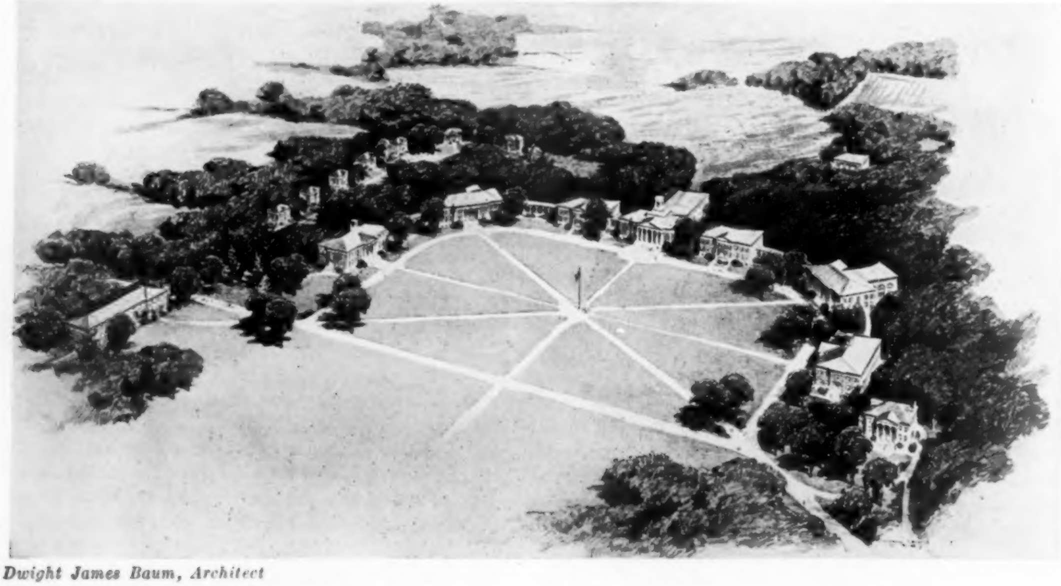


THE CENTRAL GROUP OF BUILDINGS AT CLARKSON COLLEGE OF TECHNOLOGY, POTSDAM, N. Y.
The Administration Building in the center is flanked on one side by the Electrical and on the other side by the Mechanical Engineering Buildings. They are all joined by a colonnade

building has been planned for newer branches of the engineering sciences which are now embryonic, such as aeronautical engineering, etc.

Climatic Conditions Considered in Planning Buildings

Again a horseshoe-shaped plan was decided upon, because it makes possible easy access to the various buildings. Both at Hartwick and at Clarkson it was decided that the buildings should be tied together by simple colonnades, as a protection against the severe winter weather and the rainy spring and fall seasons. The central administration and auditorium building is balanced by electrical and mechanical engineering buildings, which are so planned that a continuous basement makes possible long test rooms for hydraulic engineering, a wind chamber, etc. There are also buildings for chemical engineering, civil engineering and business administration; a gymnasium; a president's house and a students' union. Sites for three large dormitories and for professors' and instructors' homes have also been selected.



Dwight James Baum, Architect

AN ARCHITECT'S DRAWING OF THE CLARKSON COLLEGE OF THE FUTURE

A Justification of Credit Financing in School-Building Construction

BY FRANK C. KETLER

SUPERINTENDENT OF SCHOOLS, BERLIN, N. H.

IT seems strange that a society which has so generally accepted credit as an instrument in business and industry should oppose the use of credit in financing permanent public improvements. Yet there seems to be a growing belief on the part of the public that such financing, especially of school-building construction, is undesirable.

Individuals and Corporations Use Credit to Advantage

A corporation issues bonds when it wishes to enlarge its plant, and, if the management is efficient, is enabled thereby to increase production and profits. Millions of persons buying homes, automobiles, and radios enjoy the use of their purchases while they are paying for them. So long as an individual or corporation employs credit sanely, definite advantages may result from its use. A corporation which waited to expand its plant until the expansion could be paid for from profits, might be compelled to wait for years, and might even find the field preempted when it was ready to expand. The individual who refrained from building a home or buying an automobile until he could pay cash for them might miss for a considerable period the benefits and pleasures of their possession.

The Use of Cash Payments

To say that frequently credit may be employed advantageously is not to deny the wisdom of operating on a cash basis where such a policy can be followed without serious strain or inconvenience. It is not suggested that the corporation with a large surplus should always borrow money for plant expansion, or that the individual with ample resources in ready cash should buy his automobile on the installment plan merely because he has the opportunity to do so.

Frequently, however, cash payments are impossible; in order to make a desired purchase it is necessary to utilize credit or to wait until sufficient money can be saved. Under such conditions the corporation may be justified in selling its bonds or the individual in buying on the installment plan. The corporation must of course have a reasonable expectancy that the expenditure will result in a sufficient increase in earnings to justify the investment, and the individual must be careful that he is not obligating himself to payments beyond his power to meet.

The financial methods employed in public business should be such that the desired service is made available at the time of need, at no greater cost than necessary. These financial methods should also safeguard the public money and avoid sharp fluctuations in the tax rate.

The Pay-As-You-Go Policy

Where school-building construction is an annual affair, these conditions may be met by including construction costs in the current budget. Under such conditions most economists and students of government would advocate the pay-as-you-go policy. In many school districts, however, school-building construction is periodic rather than annual. Frequently the application of a strict pay-as-you-go policy would result in such great fluctuations in the tax rate and such a heavy strain on the taxpayer as to make the plan impracticable. The choice then lies between the use of credit, generally through bond issues, and the building-up of large reserves in anticipation of building needs.

At present there is some tendency on the part of school executives to advocate the latter procedure. While such a method of financing construction has much to commend it, not all the arguments advanced in its favor are entirely sound. When credit financing is wisely managed, it is to be preferred to reserve-fund financing.

The Disadvantages of Reserve-Fund Financing

With either method it is possible to avoid any great fluctuation in the tax rate, but it is more difficult with the reserve-fund method than with credit financing, owing to the fact that the building-up of the reserve will frequently be delayed until the building need is already pressing. Under such conditions the reserve must be built up over a comparatively short period of years. Otherwise, needed construction will be delayed and children will be denied the facilities which should be available to them. Furthermore, under the reserve-fund method, the building program must be planned with reference to the amount of money available. This may result occasionally in lavish expenditures through inability to resist the temptation to spend the amount of money on hand. When the reserve fund is insufficient, however, inadequate facilities may be provided because of an unwillingness to borrow money for construction purposes. Occasionally, too, the reserve fund may be built up by starving the educational program rather than by increasing the tax rate.

The Advantages of Credit Financing

Credit financing simplifies the problem of reconciling the amount of money available with the

COMPARATIVE COSTS OF BUILDING RESERVES AND BORROWING FOR PLANT CONSTRUCTION

Interest Imputed at 4 Per Cent for all Collection Prior to Ninth Year

RESERVE FUND

Year	Previous Year's Total	Taxes for Reserve	Total Subject to Imputed Interest	Interest Imputed to Prior Collection	Total at End of Year
1		$40,000.00	$ 40,000.00	$1,600.00	$ 41,600.00
2	$ 41,600.00	40,000.00	81,600.00	3,264.00	84,864.00
3	84,864.00	40,000.00	124,864.00	4,994.56	129,858.56
4	129,858.56	40,000.00	169,858.56	6,794.34	176,652.90
5	176,652.90	40,000.00	216,652.90	8,665.96	225,318.86
6	225,318.86		225,318.86	9,012.76	234,331.62
7	234,331.62		234,331.62	9,373.26	243,704.88
8	243,704.88		243,704.88	9,748.20	253,453.08
9	253,453.08		253,453.08		

BORROWING

Year	Previous Year's Total	Taxes for Principal	Taxes for Interest	Total Subject to Imputed Interest	Interest Imputed to Prior Collection	Total at End of Year
1						
2						
3						
4						
5		$40,000.00*		$ 40,000.00	$1,600.00	$ 41,600.00
6	$ 41,600.00	40,000.00	$6,400.00	88,000.00	3,520.00	91,520.00
7	91,520.00	40,000.00	4,800.00	136,320.00	5,452.80	141,772.80
8	141,772.80	40,000.00	3,200.00	184,972.80	7,398.92	192,370.92
9	192,370.92	40,000.00	1,600.00	233,971.72		

* Not borrowed, but paid direct from taxation.

amount necessary to meet construction demands, and it eliminates any necessity of postponing the erection of needed buildings. The necessary money can be made available when it is needed, without any considerable surplus or deficit.

An argument frequently advanced in favor of the reserve-fund method of financing school-building construction is that the taxpayer is saved the interest which he would have to pay were the money borrowed. This argument totally disregards the fact that the reserve-fund dollar is taken from the taxpayer several years sooner than would be necessary in the case of a bond issue. The dollar payable today represents a greater burden than the dollar payable a year hence. Interest is a recognition and a measure of this difference in values.

The Taxpayer's Burden Under the Reserve-Fund Method

In order to get an idea of the burden imposed on the taxpayer by the reserve-fund method, it is necessary to impute the interest on the reserve-fund dollar from the time it actually is collected until the time when it would have been collected under the alternative of a bond issue. The rate at which the interest is imputed can fairly be that which the school board would have to pay to borrow, since such a rate is seldom greater than that which an individual would have to pay. The table above shows that when imputed interest is added to the amount collected for the reserve fund, there is no differential in favor of that method as compared with bonding.

The table is based on the assumption that the building is to cost **$200,000** and that the money can be borrowed at 4 per cent. Payments, both to the reserve fund and to debt-retirement (borrowing), therefore have interest imputed to prior collection at 4 per cent and compounded until the date of the last payment for debt retirement. The entries for the ninth year, under the column headed "Total—Subject to Imputed Interest," indicate the burden for each of the two methods of financing construction.

Large Accumulations of Public Money Are Unwise

Finally, the reserve-fund method offers less security for public money than does bonding, since under the former plan a considerable sum of money must be held for a number of years prior to its expenditure for building purposes. Such accumulations of money are subject to loss through bank failure, mismanagement, or dishonesty. There is constant temptation to divert it to other purposes than that for which it was collected. Although such diversions are generally intended as only temporary, they frequently become permanent. Most students of public finance are inclined to question the wisdom of large accumulations of public money to be held for any considerable period of time.

The Bond Issue Is Preferable

As has previously been suggested, credit may be abused and financial difficulties ensue. But when bonds are issued for proper purposes and their retirement is scheduled at a rate consistent with the development of new needs, the bond issue has distinct advantages over the reserve-fund method of financing building construction.

Section II

DESIGN AND CONSTRUCTION OF BUILDINGS

The National Advisory Council on School Building Problems

Purposes and Progress of a New Clearing-House of Information

BY ALICE BARROWS
SPECIALIST IN SCHOOL BUILDING PROBLEMS,
U. S. OFFICE OF EDUCATION, WASHINGTON, D. C.

BECAUSE the school building problem has become a highly technical one, requiring the cooperative efforts of such different types of experts as school superintendents, school building architects, landscape architects, health specialists, heating, ventilating, and sanitation experts, a National Advisory Council on School Building Problems was proposed by the State Superintendents of Public Instruction and Commissioners of Education at their annual meeting in Washington, D. C., in 1929. At their unanimous request Dr. William John Cooper, United States Commissioner of Education, organized the Council and appointed its members. The first annual conference was held in Atlantic City in February, 1930, the second in Detroit a year later.

The general purpose of the National Advisory Council on School Building Problems is to serve as a clearing-house of information on school building problems. The specific purposes are (1) to secure comprehensive data on methods of solving school building problems in different parts of the country and under different types of school organization; (2) to make expert analyses of the data collected; and (3) to make constructive suggestions in regard to methods of solving school building problems.

School building problems cannot be studied at long range. They must be studied in terms of actual school building situations, and consideration must be given to differences due to geographical location, climate, educational aims and methods, and availability of expert service. For these reasons it was agreed that, if the Advisory Council was to serve as a national clearing-house of information on school building problems, it would be necessary to secure information through decentralized geographical units; to mobilize in those units the expert knowledge of those actually engaged in solving school building problems; and to carry on, through direct contact with these regional units, continuous research and service on such problems.

It was decided, therefore, to have nine regional councils within the National Advisory Council, each region based upon certain geographical units. The regions adopted were those already worked out by the American Institute of Architects. They fall into the following groups:

New England Region—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island.
New York Region—New York State only.
Middle Atlantic Region—Pennsylvania, New Jersey, Delaware, Maryland, West Virginia.
South Atlantic Region—Virginia, North Carolina, South Carolina, Georgia, Alabama, Florida.
Great Lakes Region—Michigan, Illinois, Indiana, Ohio, Kentucky.
Central States Region—North Dakota, South Dakota, Minnesota, Wisconsin, Iowa, Nebraska, Kansas, Missouri, Oklahoma.
Gulf States Region—Tennessee, Arkansas, Mississippi, Louisiana, Texas.
Western Mountain Region—Washington, Oregon, Idaho, Montana, Wyoming, Utah, Colorado, New Mexico.
Sierra Nevada Region—California, Arizona, Nevada.

Because the Central States Region and the Western Mountain Region proved to be too large in area for the effective work of the Advisory Council, the National Advisory Council at its last meeting voted to divide these two regions into the follow ıg four regions:

North Central Region—North Dakota, South Dakota, Minnesota, Wisconsin, and Iowa.
Central States Region—Nebraska, Kansas, Missouri, and Oklahoma.
Northwestern Region—Washington, Oregon, Montana, Idaho, and Wyoming.
Rocky Mountain Region—Utah, Colorado, and New Mexico.

Each regional council has the following members: a state superintendent of education, a city superintendent, a county superintendent, a school board member, and an architect (who is always the local regional director of the American Institute of Architects). Directors of bureaus of schoolhouse planning in state and city departments of education act as *ex officio* members. At the Detroit meeting of the Council it was voted to increase the membership of each regional council by adding two more city superintendents. On the suggestion of the regional directors of the American Institute of Architects, advisory architects who specialize in school buildings are appointed by Commissioner Cooper for each re-

gional council. Each regional council has the privilege of adding any other advisory experts who, in its opinion, would be helpful in solving school building problems.

At its first annual conference in 1930, Commissioner William John Cooper was elected Chairman of the National Advisory Council, and the writer was elected Secretary. Chairmen were also chosen for each of the regional councils. It was decided that the work of the Council should consist of a research division and a service division, and that for the present the Advisory Council should concentrate upon research studies which would give comparable data on certain fundamental phases of the school building problem in the different regions. It was also voted that these research studies should be planned and their results interpreted at meetings of each regional council held at least once during the year, the Secretary of the Council to meet with the members and advisory architects and to organize the work with them.

As a result of the meetings held by the Secretary with each of the regional councils during the spring and fall of 1930, the first research study of the Advisory Council, "The Functional Planning of School Buildings," was organized. It was decided to limit this study during the first year to elementary schools and, during the next year, to follow it with a study of the functional planning of junior and senior high schools.

Functional planning of school buildings was chosen as a subject for study because the planning and erecting of school buildings is directly dependent upon the kind of education to be carried out in the buildings. Owing to changed social and industrial conditions, which have deprived children in cities and small towns of many of the educational activities which formerly existed in community life outside the school, the educational program of the modern school has been enriched to give children the opportunity for a greater variety of activities in school than were required in the less complex civilization of fifty years ago.

The changes in educational programs have had a direct bearing upon the planning of school buildings. In order to meet the demands of the modern curriculum, a school building at the present time must contain not only classrooms but an auditorium, gymnasiums, manual training shops, cooking and sewing rooms, science rooms, a library, etc. The number and kind of rooms to be provided for depend upon the particular educational program worked out by the school authorities. School building has consequently become much more than an architectural problem. It requires farsighted planning, a well-thought-out educational program, and a nice adjustment of every detail of building design and room layout to meet the needs of the educational program.

The research study on "The Functional Planning of Elementary School Buildings" has aimed to secure data about specific elementary school buildings in each region. Each regional council selected certain cities in its region where it was known that modern elementary school buildings were being erected, and the superintendents and architects in these cities were asked to cooperate in the study by furnishing the data asked for and by preparing an exhibit which would include the exterior of the building reported upon, the plot plan, floor plans, statistical data and educational program. Eighty cities have agreed to cooperate, and exhibits from 75 of these cities have already been received. At the request of the Editor of THE AMERICAN SCHOOL AND UNIVERSITY, 17 of these exhibits, selected by him, were loaned for reproduction in this volume. (See pages 31-47.)

The superintendents and architects were asked to supply information on some 200 points, summarized in the following five questions:

1. Was the planning of the school building in question based on a school survey? How was the survey conducted?
2. Was the educational program to be carried out in the building determined upon before the building was planned? Give the program in detail.
3. What provisions were made for the site? Give a plot plan showing kinds and amount of play space as well as location of the building.
4. How was the building planned to meet the needs of the educational program? Give floor plans indicating the kind and amount of space for each activity.
5. What was the cost of the building?

At the second annual Conference of the National Advisory Council on School Building Problems, held in Detroit in February, 1931, 75 schools in as many cities in 40 states were represented in an exhibit, and the results of a preliminary tabulation of these cities were presented to the Advisory Council. The mass of material collected was considered so valuable that the Advisory Council voted to devote the present year to a thorough study of the data collected, and to present the results of this study with another exhibit at its third annual conference, to be held at the next convention of the Department of Superintendence of the National Education Association, in Washington, D. C., February, 1932. For this reason it is impossible to give any of the results of the study in this article.

At the Detroit conference in 1931, Commissioner William John Cooper was elected Chairman of the National Advisory Council for 1931-1932, Dr. Charles L. Spain, Deputy Superintendent of Schools, Detroit, Mich., was elected Vice-Chairman, and the writer was chosen Secretary. It was voted that, with the exception of two of the regional councils, the election of the regional chairmen would be carried on by mail after the meeting. The list of members of the Advisory Council and of the advisory architects for 1931-32 follows:

Members of The National Advisory Council on School Building Problems

New England Region

State Superintendent
C. N. Dempsey
Montpelier, Vt.
City Superintendents
A. J. Stoddard
Providence, R. I.
Stanley H. Holmes
New Britain, Conn.
S. Monroe Graves
Wellesley, Mass.
County Superintendent
Carl Cotton
Derry, N. H.
School Board Member
L. H. Baldwin
Rutland, Vt.
Architect (A.I.A. Member)
George H. Gray
New Haven, Conn.

New York Region

State Superintendent
Frank P. Graves
Albany, N. Y.
City Superintendents
Wm. H. Holmes
Mount Vernon, N. Y.
A. W. Miller
Glens Falls, N. Y.
Herbert S. Weet
Rochester, N. Y.
County Superintendent
Glenn G. Steele
Utica, N. Y.
School Board Member
Frank H. Wood
Chatham, N. Y.
Architect (A.I.A. Member)
Albert L. Brockway
Syracuse, N. Y.
Chief, Division of Schoolhouse Planning, State Department of Education
Joseph H. Hixson
Albany, N. Y.
Representative of City School Building Department
Francis R. Scherer
Rochester, N. Y.

Middle Atlantic Region

State Superintendent
Charles H. Elliott
Trenton, N. J.
City Superintendents
Ben G. Graham
Pittsburgh, Pa.
Frank G. Pickell
Montclair, N. J.
D. B. Kraybill
Wheeling, W. Va.
County Superintendent
E. W. Broome
Rockville, Md.
School Board Member

Architect (A.I.A. Member)
Charles T. Ingham
Pittsburgh, Pa.
Chief, Division of Schoolhouse Planning, State Department of Education
HuBert C. Eicher
Harrisburg, Pa.

South Atlantic Region

State Superintendent
A. T. Allen
Raleigh, N. C.
City Superintendents
C. B. Glenn
Birmingham, Ala.
John G. Kelly
Bennettsville, S. C.
Willis A. Sutton
Atlanta, Ga.
County Superintendent
G. Miller Eleazer
Columbia, S. C.
School Board Member
W. H. Gaines
Atlanta, Ga.
Architect (A.I.A. Member)
F. O. Adams
Tampa, Fla.
Chiefs, Divisions of Schoolhouse Planning, State Departments of Education
S. T. Clemons
Columbia, S. C.
J. L. Graham
Atlanta, Ga.
R. E. Ledbetter
Montgomery, Ala.
Raymond V. Long
Richmond, Va.
J. O. Martin
Atlanta, Ga.

Great Lakes Region

State Superintendent
Francis G. Blair
Springfield, Ill.
City Superintendents
Wm. A. Wirt
Gary, Ind.
Charles L. Spain
Detroit, Mich.
Henry H. Hill
Lexington, Ky.
County Superintendent
H. E. Hall
Bowling Green, Ohio
School Board Member
John H. Webster
Detroit, Mich.
Architect (A.I.A. Member)
Frederick W. Garber
Cincinnati, Ohio
Chief, Division of Schoolhouse Planning, State Department of Education
J. W. Brooker
Frankfort, Ky.
Representative of City School Building Department
George Schulz
Detroit, Mich.

North Central Region

State Superintendent
E. C. Giffen
Pierre, S. Dak.
City Superintendents
Milton C. Potter
Milwaukee, Wis.
Carroll R. Reed
Minneapolis, Minn.
J. G. Moore
Fargo, N. Dak.
County Superintendent
E. C. Lynn
Donnellson, Iowa
School Board Member
Jacob G. Huber
Sioux City, Iowa
Architect (A.I.A. Member)
Frederick M. Mann
Minneapolis, Minn.
Chiefs, Divisions of Schoolhouse Planning, State Departments of Education
Samuel A. Challman
St. Paul, Minn.
H. W. Schmidt
Madison, Wis.

Central States Region

State Superintendent
Charles W. Taylor
Lincoln, Nebr.
City Superintendents
F. H. Barbee
St. Joseph, Mo.
Merle C. Prunty
Tulsa, Okla.
Millard Lefler
Lincoln, Nebr.
County Superintendent
Dave H. Wallace
Topeka, Kans.
School Board Member
D. C. Todd
St. Louis, Mo.
Architect (A.I.A. Member)
Frederick M. Mann
Minneapolis, Minn.
Chief, Division of Schoolhouse Planning
Haskell Pruett
Oklahoma City, Okla.

Gulf States Region

State Superintendent
S. M. N. Marrs
Austin, Texas
City Superintendents
Nicholas Bauer
New Orleans, La.
J. W. Ramsey
Fort Smith, Ark.
E. E. Oberholtzer
Houston, Texas
County Superintendent
Sue Powers
Memphis, Tenn.
School Board Member
J. B. Howie
Gulfport, Miss.
Architect (A.I.A. Member)
M. H. Furbringer
Memphis, Tenn.
Chiefs, Divisions of Schoolhouse Planning, State Departments of Education
J. Odell Baker
Little Rock, Ark.
W. G. Eckles
Jackson, Miss.
J. Fred Horn
Austin, Texas

Northwestern Region

State Superintendent
N. D. Showalter
Olympia, Wash.
City Superintendent
Charles A. Rice
Portland, Ore.
Worth McClure
Seattle, Wash.
County Superintendent

School Board Member

Architect (A.I.A. Member)
Fred Fielding Willson
Bozeman, Mont.

Rocky Mountain Region

State Superintendent
Inez Lewis
Denver, Colo.
City Superintendents
Homer W. Anderson
Denver, Colo.
George N. Child
Salt Lake City, Utah
John Milne
Albuquerque, N. Mex.
County Superintendent
Andrew Ogle
Greeley, Colo.
School Board Member
W. W. Wilson
Sandy, Utah
Architect (A.I.A. Member)
Fred Fielding Willson
Bozeman, Mont.

Sierra Nevada Region

State Superintendent
Vierling Kersey
Sacramento, Calif.
City Superintendents
C. E. Rose
Tucson, Ariz.
J. M. Gwinn
San Francisco, Calif.
F. F. Martin
Santa Monica, Calif.
County Superintendent
Ada York
San Diego, Calif.
School Board Member
H. H. Baskerville
Los Angeles, Calif.
Architect (A.I.A. Member)
Fred H. Meyer
San Francisco, Calif.
Chief, Division of Schoolhouse Planning, State Department of Education
Andrew P. Hill, Jr.
Sacramento, Calif.

ADVISORY ARCHITECTS [1]

New England Region

Frank Irving Cooper
Boston, Mass.
Kilham, Hopkins & Greeley
Boston, Mass.
R. Clipston Sturgis
Boston, Mass.

New York Region

Wesley S. Bessell
New York, N. Y.
H. Templeton Blanchard
New York, N. Y.
G. Howard Chamberlain
Yonkers, N. Y.
Edward B. Green & Sons
Buffalo, N. Y.
Edward S. Hewitt
New York, N. Y.
Albert H. Hopkins
Buffalo, N. Y.
James W. O'Connor
New York, N. Y.
Peabody, Wilson & Brown
New York, N. Y.
James A. Randall
Syracuse, N. Y.
Karl Schmill
Buffalo, N. Y.
Frank A. Spangenberg
Buffalo, N. Y.

Middle Atlantic Region

James O. Betelle
Newark, N. J.
Clarence W. Brazer
Chester, Pa.
Irwin T. Catharine
Philadelphia, Pa.

South Atlantic Region

Willard C. Northup
Winston-Salem, N. C.
Chas. C. Wilson
Columbia, S. C.

Great Lakes Region

Walter Roy MacCornack
Cleveland, Ohio

[1] The list of Advisory Architects is not complete.

Great Lakes Region—Cont.
Frank A. Childs
Chicago, Ill.
Warren S. Holmes
Lansing, Mich.

Central States Region
Wm. B. Ittner
St. Louis, Mo.

Gulf States Region
DeWitt & Washburn
Dallas, Texas
Harry D. Payne
Houston, Texas
Raymond Phelps
San Antonio, Texas
Herbert Voelcker
Wichita Falls, Texas

Northwestern Region
George H. Jones
Portland, Ore.

Sierra Nevada Region
John C. Austin
Los Angeles, Calif.
John J. Donovan
Oakland, Calif.
T. C. Kistner
Los Angeles, Calif.
Lesher & Mahoney
Phoenix, Ariz.
Marsh, Smith & Powell
Los Angeles, Calif.
Roy Place
Tucson, Ariz.

Recent Publications in the School-Building Field

A Selected List Compiled for The American School and University

BY JOHN W. SAHLSTROM

ASSOCIATE IN EDUCATIONAL ADMINISTRATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

The Elementary Training School Building.—By Michael L. Alstetter. George Peabody College for Teachers, Nashville, Tenn. 1930. 103 pp. $1.00.

The conclusions and recommendations submitted in this investigation were drawn from the results of a questionnaire and case study. It sets up tentative standards, based on opinion, on the planning of training school buildings for teachers colleges so that they may function efficiently as laboratory schools for purposes of observation, demonstration and supervised study on the part of the student.

Radio and Electric Power Supply Equipment for Schools.—By Edward Blom. Bureau of Publications, Teachers College, Columbia University. 1930. 180 pp. $1.50.

This investigation deals with electrical equipment used for instructional purposes in schools. The particular kinds of equipment considered are those associated with school radio installations and electric power supply for high school science rooms. It furnishes school administrators with information to guide them in selecting equipment and in placing installations, and informs manufacturers of the needs of the schools which their products must satisfy.

Buildings and Equipment for Home Economics.—By Melvin Brodshaug. Bureau of Publications, Teachers College, Columbia University. 1931. (In press.)

A very thorough analysis of the planning of home economics suites. The purpose of the investigation was to evaluate present practice and to determine as objectively as possible the characteristics of well-designed home economics plants. Building problems, space allotments, and equipment are given extensive treatment. The suggestions arising from the study should be valuable to those responsible for the planning of home economics departments.

Check List Materials for Public School Building Specifications.—By Lee Byrne. Bureau of Publications, Teachers College, Columbia University. 1931. (In press.)

The checking list is so developed that users may select lists of different sizes to suit their purposes. The list is designed to provide city superintendents of schools and school business managers with a tool that will be of aid to them in judging sets of specifications.

Utilization of College Instruction Rooms.—By Ray L. Hamon. George Peabody College for Teachers, Nashville, Tenn. 1930. 100 pp. $5.00.

This volume summarizes an investigation of the utilization of rooms and student stations in college instruction rooms. The study develops techniques and establishes tentative standards of utilization for various types of instruction rooms in various types of colleges. It furnishes a means of determining the degree of congestion and provides a technique for estimating the number of instruction rooms needed.

School Buildings of Today and Tomorrow.—By W. K. Harrison and C. E. Dobbin. Architectural Book Publishing Company, Inc., New York. 1931. 233 pp. $16.50.

Part I of this book describes and discusses the design of the school building of yesterday and the school of tomorrow. Part II presents plans and illustrations of a group of modern schools in foreign countries. Part III discusses the advantages of standardization and submits plans and illustrations to show how this system operates in the New York schools. The volume is replete with attractive illustrations, detailed plans and diagrams.

Municipal, School and University Stadia.—By Randolph O. Huus and Dorothy I. Cline. Publication No. 18, Municipal Administration Service, New York. 1931. 33 pp. 35¢.

Data with regard to 117 of the 144 stadia in the United States have been assembled to make available to institutions and communities contemplating a stadium, information on such points as cost, type, size, use, management and means of financing. An annotated bibliography is included.

School Buildings, Sites and School District Bonds.—New York (State) University, Law Division, Law Pamphlet No. 1, Albany, N. Y. 1929. 61 pp. Free.

This pamphlet includes information as to the selection and acquisition of schoolhouse sites, the erection of new school buildings, the erection of additions to, and the alteration and improvement of existing school buildings, and the issuance and sale of school district bonds for any or all of these purposes. Legal procedure and safeguards are developed and presented in blank forms. The treatment is confined to New York State.

School Playgrounds.—By Marie M. Ready. Office of Education Pamphlet No. 10, Washington, D. C. 1930. 40 pp. 5¢.

The playground information submitted was secured through the cooperation of the state departments of education. The discussion is under four heads: (1) playground areas, suggested standards; (2) playground layouts and equipment; (3) use of playgrounds after school hours; and (4) progress in school playground development.

Public Elementary School Plant.—By Charles L. Spain, Arthur B. Moehlman, and Fred W. Frostic. Rand McNally and Company, New York, 1930. 602 pp. $4.00.

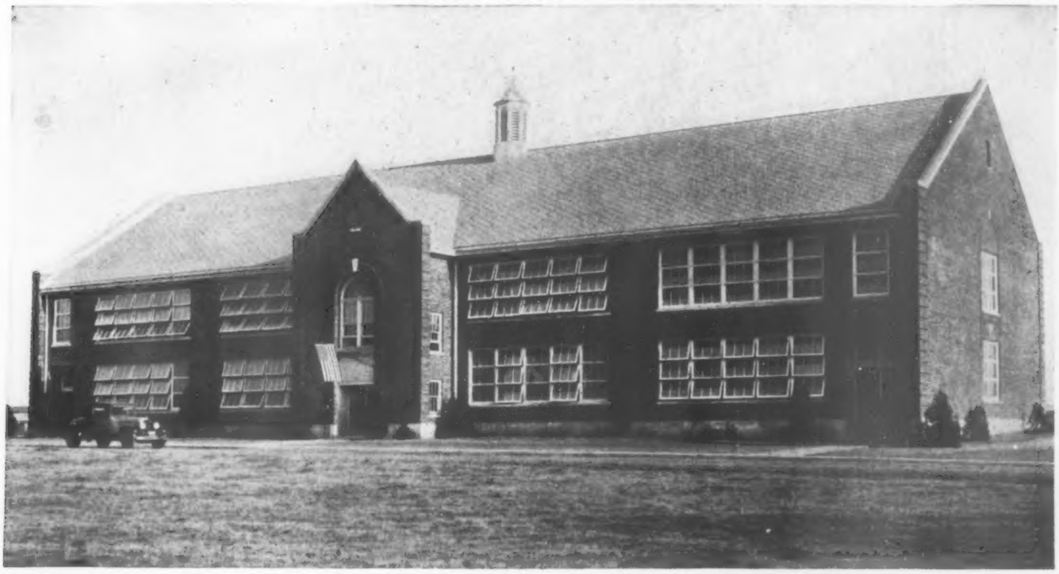
The authors approach the problem from the standpoint of the basic educational policies in terms of which all school plant planning must proceed. Elementary education is considered in three phases: (1) traditional; (2) transitional; and (3) the probable school of the future. Methods of determining space requirements and the relative physical efficiency of plan types are followed by a discussion of the technique of designing an elementary school plant. The text is generously interspersed with plates and floor plans illustrating the factors discussed.

Campus Standards for Country Day and Boarding Schools.—By G. D. Strayer, N. L. Engelhardt, and T. C. Burton. Bureau of Publications, Teachers College, Columbia University. 1930. 51 pp. $1.00.

The authors have developed a campus score card for country day and boarding schools. It lists more than 70 separate items that contribute toward the most desirable campus. The score card is followed by a description of what should be considered an ideal situation for each item. The arrangement of the booklet is such that a very fair appraisal may be made of any campus.

This list supplements the bibliography published in the 1930 Edition of The American School and University (page 539).

The following photographs and floor plans of 17 modern elementary schools in various parts of the country were selected by the Editor of THE AMERICAN SCHOOL AND UNIVERSITY *from exhibits representing 75 schools, shown at the second annual conference of the National Advisory Council on School Building Problems in Detroit, February, 1931.*

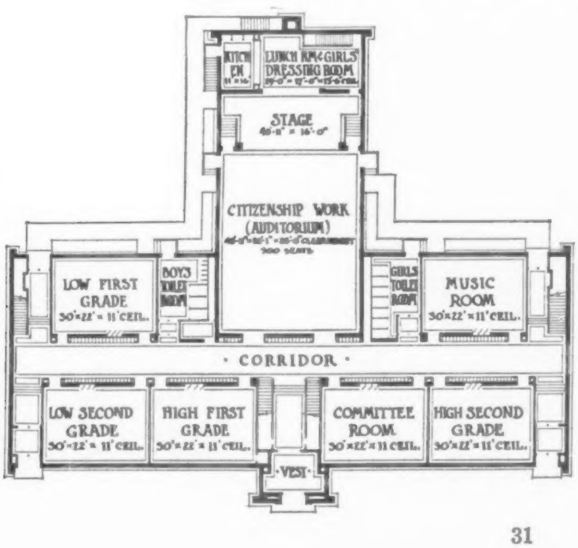


Perkins, Chatten & Hammond, Chicago, and Haralson & Nelson, Fort Smith, Associate Architects

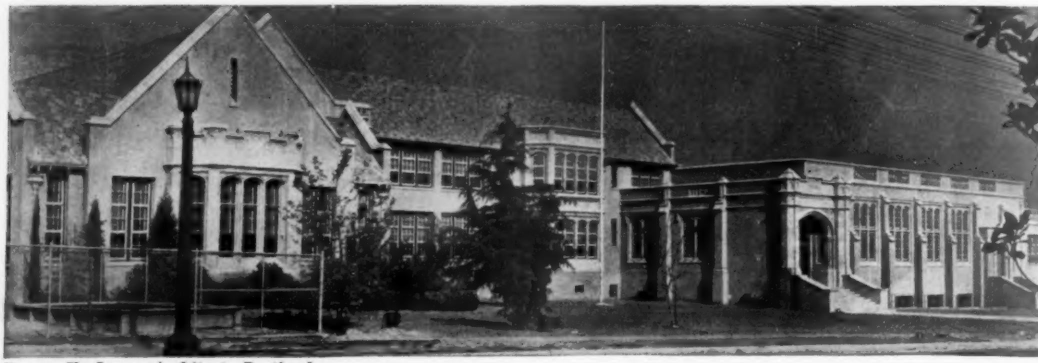
Trusty Elementary School, Fort Smith, Ark.

Built and completed in 1928, this building cost $82,700, or 16.54¢ a cubic foot. The rooms on the first floor are indicated on the plan shown below. The second floor contains a library, a social science room, an art and health room and home rooms for the fifth and sixth grades (combined), the fourth grade and the third grade, each 30′ x 22′ x 11′. The corridors are 10′ wide.

The auditorium-gymnasium, 40′ 11″ x 52′ 1″ x 25′ 0″, has a stage 40′ 11″ x 16′ 0″ x 25′ 0″, and seats 300 on the main floor and 170 in the balcony. Chairs are stored under the stage. The boys' dressing room is 16′ 0″ x 16′ 0″ x 8′ 6″ and the girls' is 29′ 0″ x 17′ 0″ x 13′ 6″. There are three outdoor playgrounds, one for boys' and girls' basket-ball, 60′ x 90′, one the same size for baseball, and one 200′ x 90′, for football.



The information about the 17 schools which are illustrated in these pages was obtained from the statistical charts, made out in standard form, which are part of the exhibit for each school. Because all but two of the schools have heating plants incorporated in the building, the location of the plant is mentioned in only these two cases. None of the schools has a swimming pool and only one has an outdoor play shed, so these facts are not mentioned in each summary.



George H. Jones, Architect, Portland.

Daniel Webster School, Pasadena, Calif.

This school was built in two units, the first of which was completed in 1927 and the second in 1930; the first cost $97,763, or 25¢ a cubic foot, and the cost of the second was $121,200, or 20¢ a cubic foot. The movable equipment, including desks and seats, chairs and tables, cost $9,700. The cost of improving the site was $9,400. A plot plan is shown on page 209.

The corridors are 10′ wide. The dimensions of the various rooms are as follows:

Kindergarten—34′ 0″ x 36′ 6″ x 13′ 0″
Classrooms—35′ 6″ x 23′ 0″ x 12′ 0″
Music—20′ 0″ x 55′ 0″ x 11′ 6″
Library—16′ 0″ x 21′ 0″ x 12′ 0″
Art—35′ 6″ x 23′ 0″ x 12′ 0″
Nature Study—35′ 6″ x 23′ 0″ x 12′ 0″

The auditorium, which seats 600, is 87′ 0″ x 57′ 0″ x 28′ 0″, and the stage behind the proscenium arch is 51′ 0″ x 16′ 0″ x 25′ 0″. The floor is, level, 54′ 0″; and sloping, 33′ 0″. The two dressing rooms are 20′ 0″ x 30′ 0″.

The thirteen playgrounds, of standard size, include one basketball, two tennis, two volleyball and seven handball courts, three baseball diamonds and one soccer field.

FIRST FLOOR PLAN

Marsh, Smith & Powell, Architects, Los Angeles

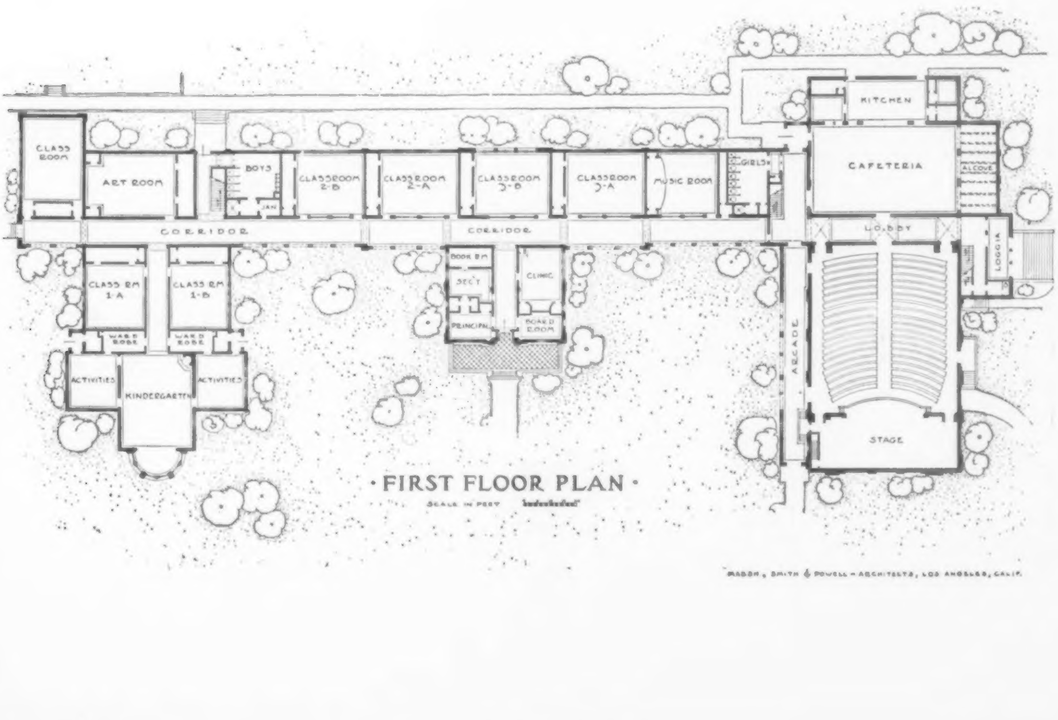
Elementary School, Sierra Madre, Calif.

The building was completed in 1930 at a total cost (including equipment) of $177,361, and a cubic-foot cost of 20¢; $15,000 in addition was spent to improve the site. Movable equipment, including special heating, cafeteria equipment and auditorium seating, cost $8,278. Desks, etc., were moved in from an old building.

The building consists of two stories. Corridors are 10′ wide, and ceilings are at least 12′ high. The following are the dimensions of the rooms:

Kindergarten—24′ x 36′ x 16′
Activity rooms—21′ x 21′ x 12′
Classrooms, Grades 1-6—23′ x 30′ x 12′
Music room—23′ x 35′ x 12′
Art room—23′ x 35′ x 12′
Clinic room—17′ x 20′ x 12′
Book room—9′ x 17′ x 12′
Secretary's office—10′ x 12′ x 12′
Principal's office—10′ 6″ x 17′ x 12′
Board room—10′ x 17′ x 12′
Special activity room (corrective room)—30′ x 35′ x 16′
Library—16′ x 29′ 6″ x 12′
Teachers' room—10′ x 14′ 6″ x 12′
Cafeteria—37′ x 71′ x 20′
Kitchen—16′ x 30′ x 14′

The auditorium, 56′ x 72′ x 32′, has a bowled floor and a seating capacity of 613. The stage behind the proscenium arch is 56′ x 20′ x 30′. The two dressing rooms are 12′ x 16′, and the stage storage is 18′ x 27′. There is no gymnasium, but a corrective room adjacent to a sun porch has been provided.



· FIRST FLOOR PLAN ·

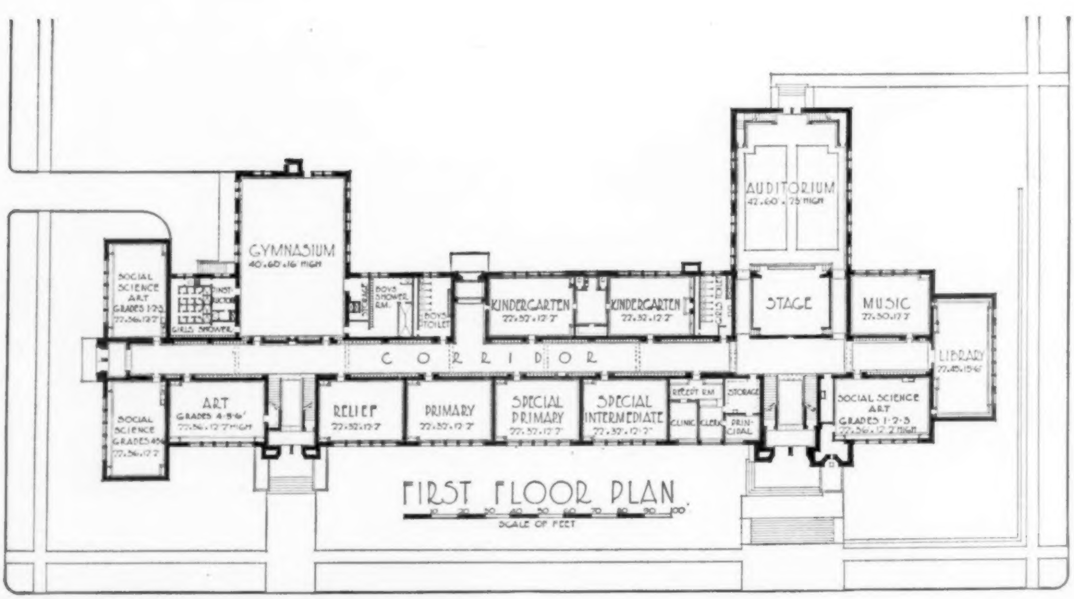
G. Meredith Musick, Architect

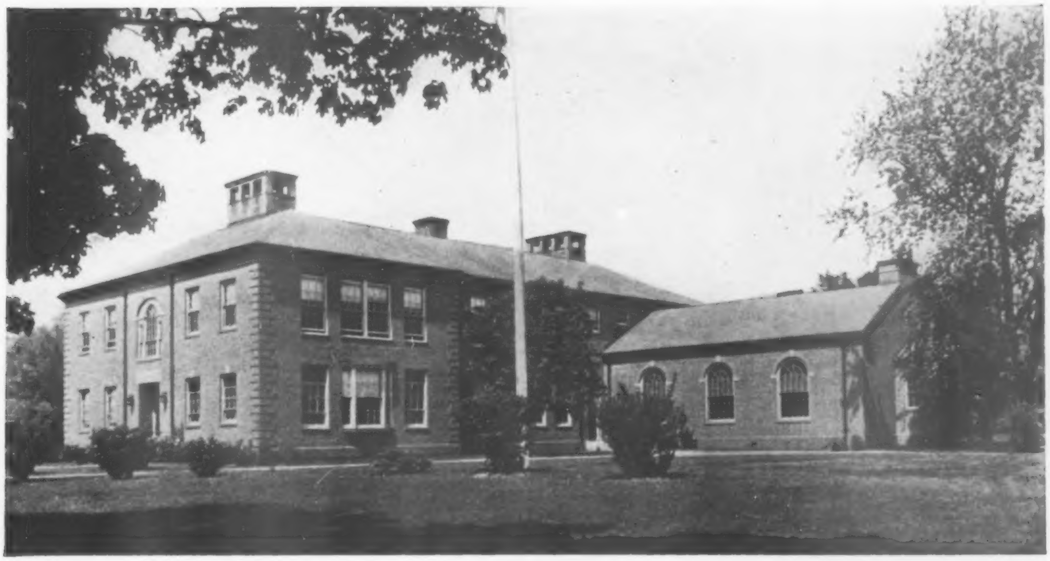
Bryant - Webster School, Denver, Colo.

The cost of the building, completed in 1930, was $243,000. The cubic-foot cost was 25.2¢. Movable equipment—desks and seats, chairs and tables—cost $13,000. Improving the site required $2,500.

Corridors are 12′ 0″ wide. The home rooms on the second floor are also 22′ x 32′ x 12′ 2″.

The auditorium seats 280 on the main floor, which is level, and 126 in the balcony. The gymnasium was made a foot larger and 4 feet higher than is indicated on the plan; it is 40′ x 61′ x 20′. There are two dressing rooms with showers.





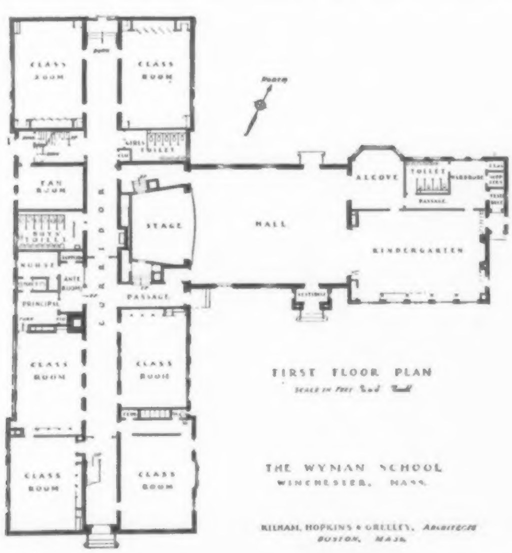
Wyman School, Winchester, Mass.

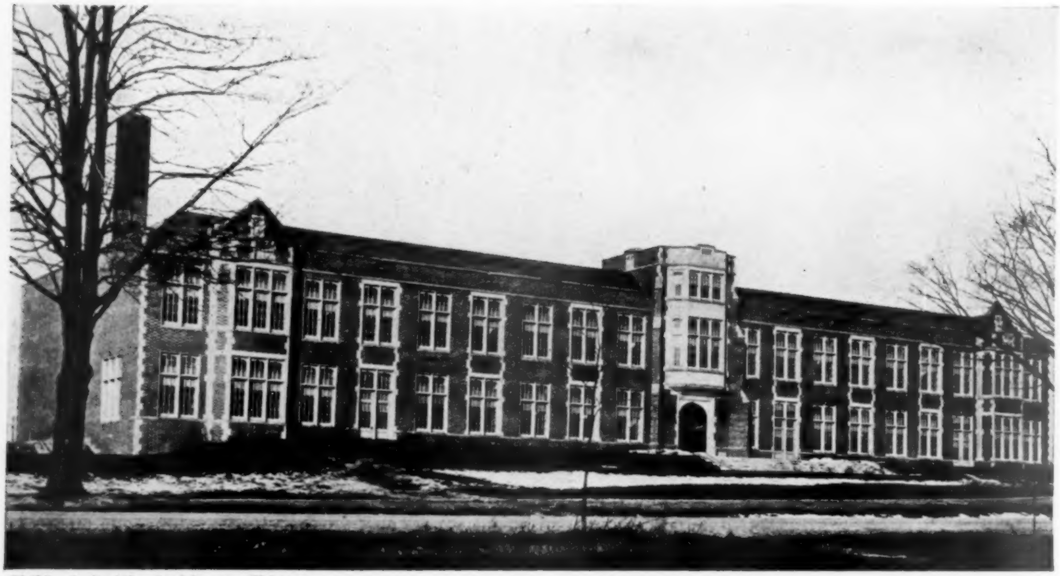
The main building, completed in 1923, cost $116,919.71, or 35¢ a cubic foot, and an addition, constructed in 1928, cost $61,792.92, or 39¢ a cubic foot, making a total cost of $178,712.63, exclusive of the $5,787.67 which was spent for desks, seats, chairs and tables, supplementing the furniture and fixtures available from an old building. Improving the site cost $2,397.11. There is a playground 130′ x 150′, as indicated on the plot plan on page 210.

Corridors are 10′ wide. The following are the dimensions of the rooms:

Kindergarten—28′ 6″ x 40′ 8″ x 13′ 0″
Kindergarten alcove—17′ 0″ x 18′ 0″ x 13′ 0″
Classrooms (1st floor)—21′ 0″ x 30′ 0″ x 12′ 0″
Classrooms (2nd floor)—21′ 0″ x 30′ 0″ x 12′ 0″
Teachers' room—21′ 0″ x 14′ 0″ x 8′ 6″
Stock room—16′ 0″ x 13′ 0″ x 11′ 0″
Lunch room—21′ 0″ x 20′ 6″ x 11′ 0″
Auditorium (exclusive of stage)—37′ 4″ x 50′ 4″ x 17′ 0″
Stage (behind proscenium arch)—22′ 6″ x 17′ 0″ x 12′ 6″

There are no dressing rooms. The auditorium seats 300 and has a level floor.





Childs & Smith, Architects, Chicago

Longfellow Elementary School, Pontiac, Mich.

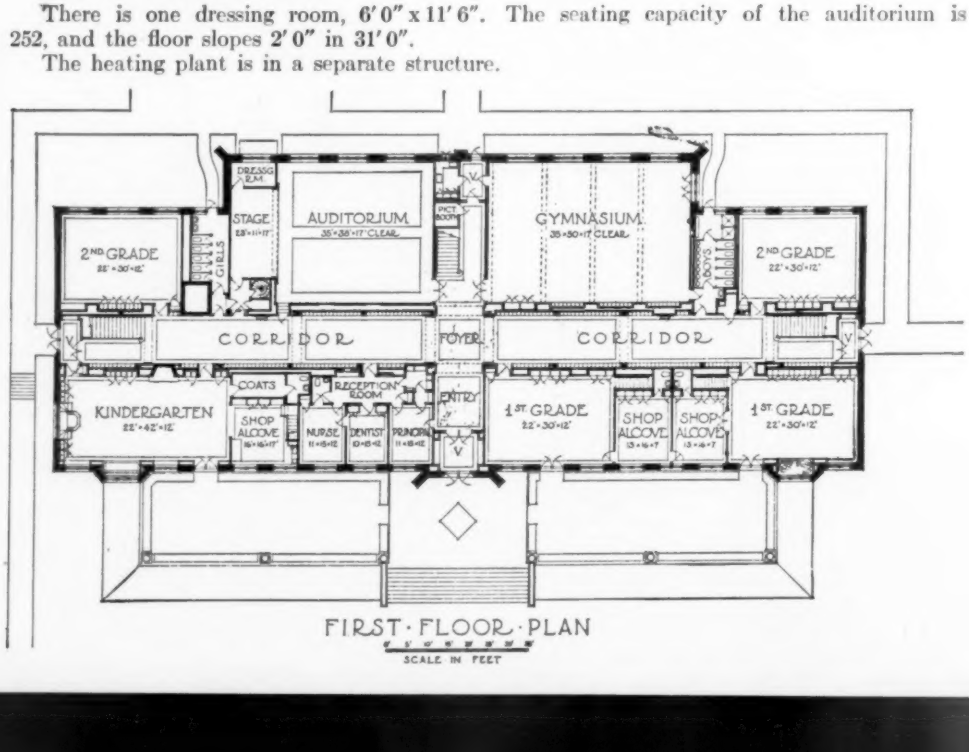
The building, of fire-resistive construction in its walls, floors, stairs, ceilings and roof, with wood finish and wood or composition floor surfaces, was completed in 1929 at a cubic-foot cost of 40¢. The general construction, heating, ventilating, electric work, plumbing and architects' fees amounted to $235,309, and the cost of movable equipment was $8,100. The cost of improving the site was $3,600. A plot plan is shown on page 209.

Corridors are 12′ wide. The dimensions of rooms on the second floor, for which a plan is not shown, are:

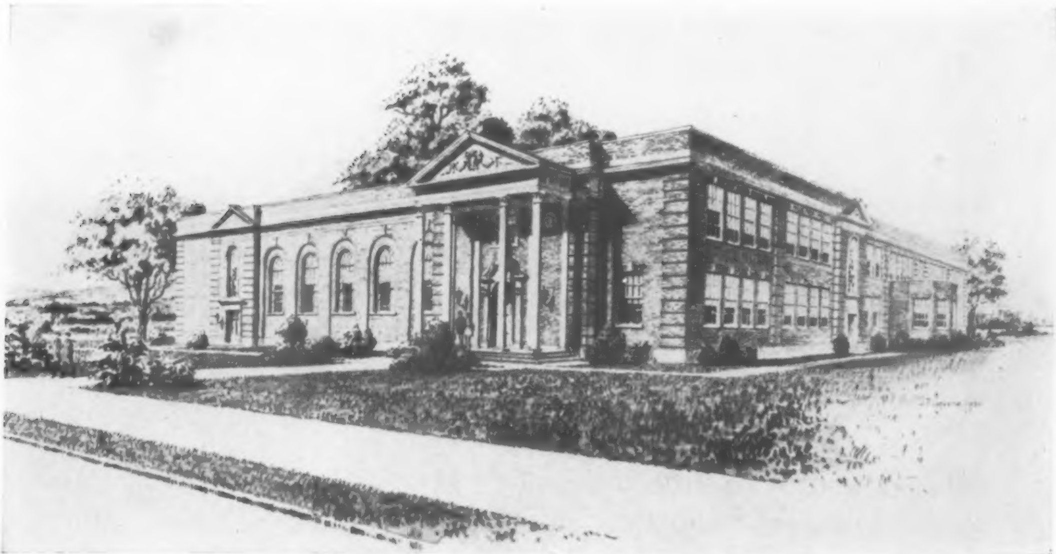
Two third grade rooms—22′ 0″ x 30′ 0″ x 12′ 0″
Two mathematics rooms—22′ 0″ x 30′ 0″ x 12′ 0″
Two history rooms—22′ 0″ x 30′ 0″ x 12′ 0″
Two literature and reading rooms—22′ 0″ x 30′ 0″ x 12′ 0″
Two geography and science rooms—25′ 0″ x 35′ 0″ x 12′ 0″
Library and exhibits room—15′ 0″ x 26′ 0″ x 12′ 0″
Industrial arts room—35′ 0″ x 36′ 0″ x 12′ 0″
Special groups room—14′ 0″ x 35′ 0″ x 12′ 0″
Gymnasium—35′ 0″ x 50′ 0″ x 17′ 0″
Auditorium (exclusive of stage)—35′ 0″ x 38′ 0″ x 17′ 0″
Stage (behind proscenium arch)—23′ 0″ x 11′ 0″ x 17′ 0″

There is one dressing room, 6′ 0″ x 11′ 6″. The seating capacity of the auditorium is 252, and the floor slopes 2′ 0″ in 31′ 0″.

The heating plant is in a separate structure.



FIRST · FLOOR · PLAN



Tooker & Marsh, New York City, and Milton Lee Crandall, Glens Falls, Associate Architects

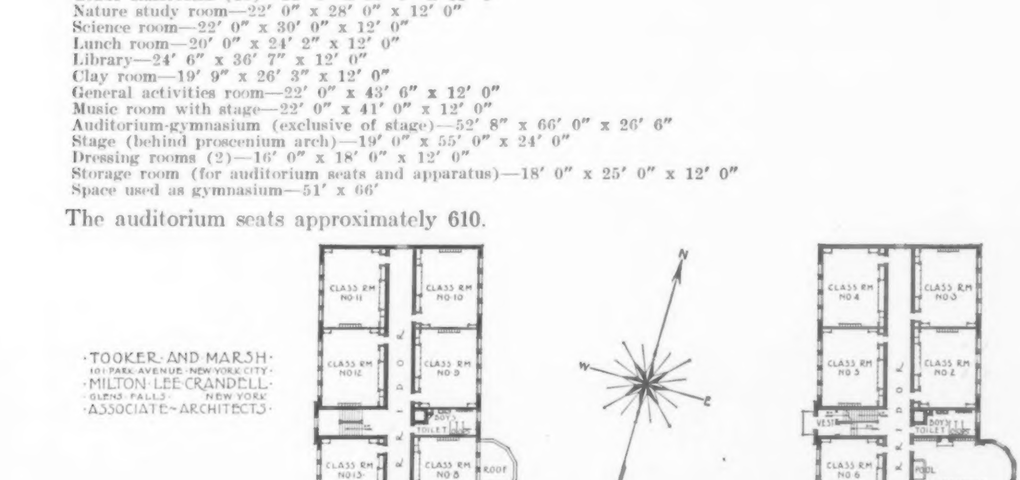
Broad Street Grade School, Glens Falls, N. Y.

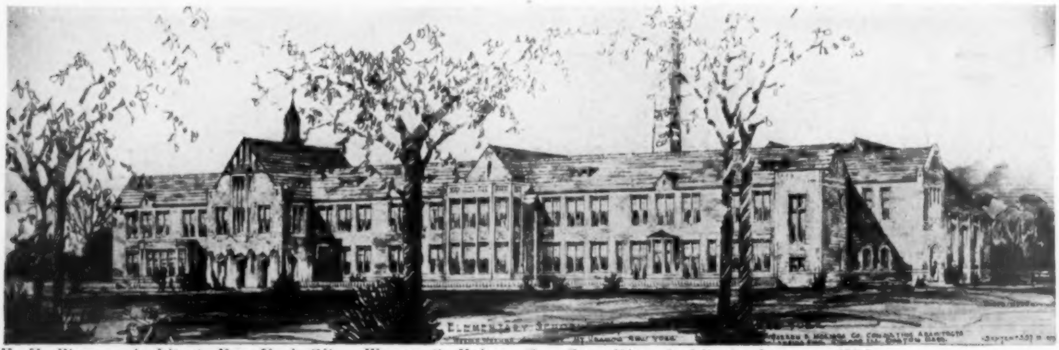
Construction was started November 15, 1930. The cubic-foot cost is 31¾¢, and the total cost exclusive of movable equipment is $269,437. Desks, chairs, seats and tables cost $26,000. Walls, floors, stairways and ceilings are of fire-resistive construction, with wood finish and wood or composition floor surfaces and a wood roof.

Corridors are 9′ 0″ and 10′ 0″ wide. Room dimensions are as follows:

Kindergarten—22′ 0″ x 44′ 7″ x 12′ 0″
Grade classrooms (13)—22′ 0″ x 30′ 0″ x 12′ 0″
Nature study room—22′ 0″ x 28′ 0″ x 12′ 0″
Science room—22′ 0″ x 30′ 0″ x 12′ 0″
Lunch room—20′ 0″ x 24′ 2″ x 12′ 0″
Library—24′ 6″ x 36′ 7″ x 12′ 0″
Clay room—19′ 9″ x 26′ 3″ x 12′ 0″
General activities room—22′ 0″ x 43′ 6″ x 12′ 0″
Music room with stage—22′ 0″ x 41′ 0″ x 12′ 0″
Auditorium-gymnasium (exclusive of stage)—52′ 8″ x 66′ 0″ x 26′ 6″
Stage (behind proscenium arch)—19′ 0″ x 55′ 0″ x 24′ 0″
Dressing rooms (2)—16′ 0″ x 18′ 0″ x 12′ 0″
Storage room (for auditorium seats and apparatus)—18′ 0″ x 25′ 0″ x 12′ 0″
Space used as gymnasium—51′ x 66′

The auditorium seats approximately 610.





H. H. Werner, Architect, New York City; Warren S. Holmes Co., Consulting Architects, Lansing, Mich.

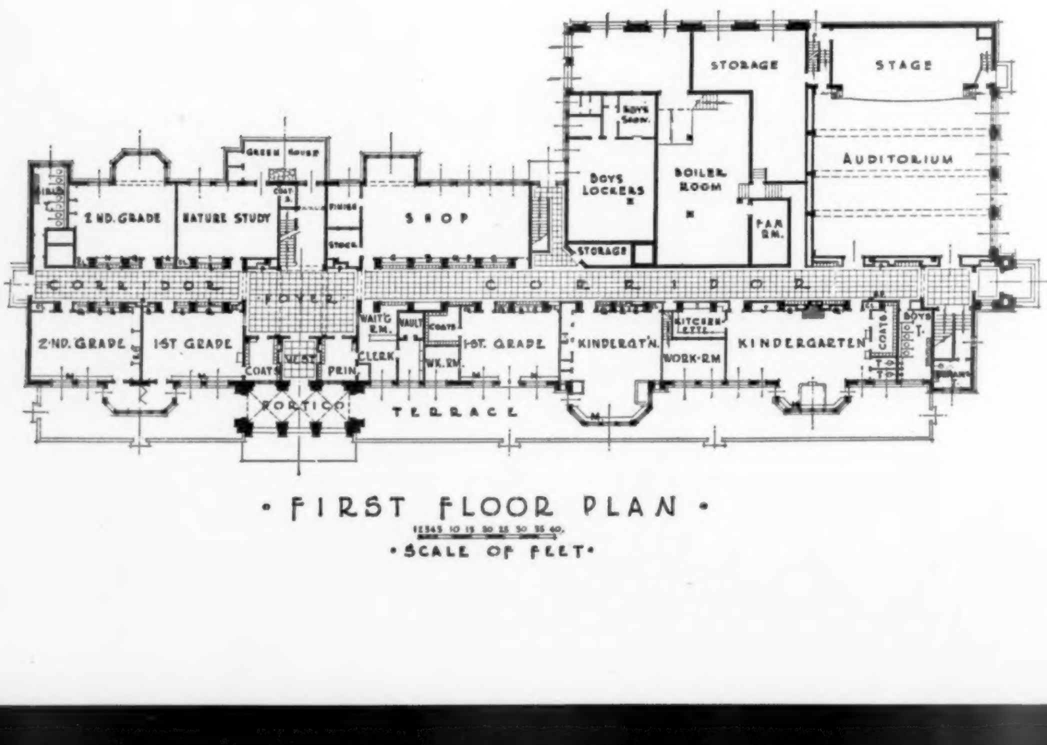
Elementary School No. 16, Mt. Vernon, N. Y.

Construction was begun in July, 1930. The cubic-foot cost was 45¢ and the total cost of building and equipment, $430,539.35. Movable equipment cost $30,000. Twenty-five thousand dollars was spent in improving the site. There are four play courts.

Main corridors are 9′ 10″ wide. The following are the dimensions of the rooms:

Library—30′ 0″ x 26′ 0″ x 11′ 6″
Art—32′ 0″ x 30′ 0″ x 11′ 6″
Music—40′ 0″ x 22′ 0″ x 11′ 6″
1 Kindergarten—32′ 0″ x 25′ 0″ x 12′ 0″
1 Kindergarten—43′ 0″ x 23′ 0″ x 12′ 0″
2 First Grade rooms—30′ 0″ x 22′ 0″ x 12′ 0″
2 Second Grade rooms—30′ 0″ x 22′ 0″ x 12′ 0″
Nature study—30′ 0″ x 22′ 0″ x 12′ 0″
Six home rooms—30′ 0″ x 22′ 0″ x 11′ 6″
Natural science—30′ 0″ x 22′ 0″ x 11′ 6″
Social science—30′ 0″ x 22′ 0″ x 11′ 6″
Shop—50′ 0″ x 22′ 0″ x 12′ 0″
Gymnasium—70′ 0″ x 50′ 0″ x 20′ 0″
Auditorium (exclusive of stage)—53′ 0″ x 50′ 0″ x 23′ 0″
Stage—48′ 0″ x 17′ 0″ x 33′ 0″

The auditorium floor is level and the seating capacity is 448. There are two dressing rooms, one 8′ 0″ x 10′ 0″ x 8′ 6″, and one 6′ 0″ x 6′ 0″ x 6′ 3″.



• FIRST FLOOR PLAN •

• SCALE OF FEET •

Francis R. Scherer, Architect, Rochester

Frank Fowler Dow School, Rochester, N. Y.

Completed in 1930, the building cost $323,002.88, a cubic-foot cost of 35.8¢, exclusive of concrete piles. Movable equipment cost $7,070.78, and $2,659.92 was spent in improving the site. The heating plant is in a separate structure, adjacent to the building.

Corridors are 9′ 7″ wide. All classrooms are 30′ 0″ x 23′ 8″ x 12′ 0″. The kindergarten room is 26′ 2½″ x 26′ 2½″ x 12′, with two alcoves each 17′ 9″ x 12′ 1½″ x 12′. The lecture room on the second floor is 43′ 11½″ x 23′ 8″ x 12′. The auditorium-gymnasium, which has a level floor and seats 650, is 48′ x 93′ x 22′ exclusive of the stage. The stage behind the proscenium arch is 15′ x 23′ x 30′. The one dressing room is 15′ x 26′. Chairs for the auditorium are stored in chair-storage rooms.

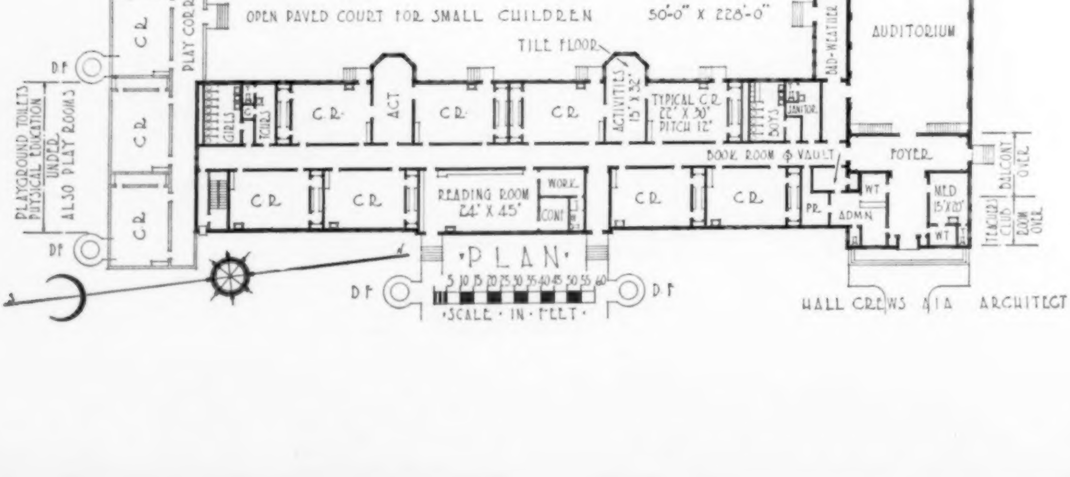
FIRST FLOOR PLAN

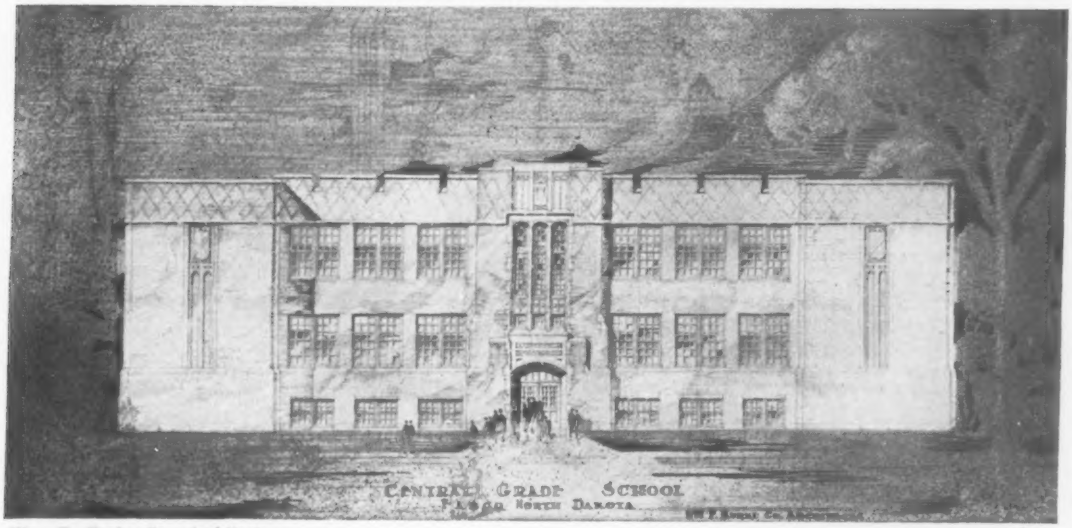
Hall Crews, Architect

Ardmore Elementary School, Winston - Salem, N. C.

The cost of the building, completed in 1929, was $122,574.76, representing a cubic-foot cost of 23.7¢. Equipment cost $8,240.06, and improving the site $7,690.61. The building consists of one story and basement.

All classrooms are 22′ 0″ x 30′ 0″ x 12′ 0″. Corridors are 9′ 0″ wide. The auditorium exclusive of the stage is 45′ 0″ x 76′ 0″, with a ceiling height of 23′ in front and 19′ 6″ in the rear. The floor is sloping. The stage behind the proscenium arch is 12′ 0″ x 45′ 0″ x 24′ 0″. The seating capacity is 627. There are no dressing rooms, nor is there a gymnasium. Open-air play is used. Underneath the building are two play sheds, 25′ x 28′ each. While there is no swimming pool at present, one is contemplated.



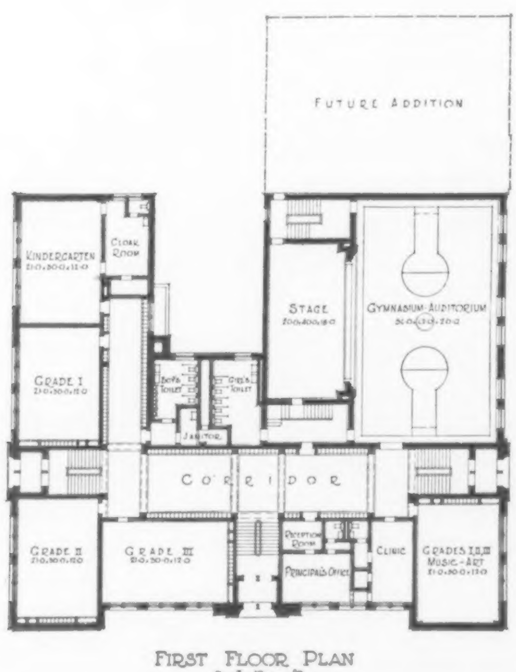


Wm. F. Kurke Co., Architects

Emerson H. Smith School, Fargo, N. Dak.

The building, completed in January, 1931, cost $122,000, or 24¢ a cubic foot. Equipment cost $8,000, and improving the site, $5,000.

Corridors are 15′ and 9′ wide. Classrooms are all 21′ 0″ x 30′ 0″ x 12′ 0″. The auditorium-gymnasium, which seats 440, is 36′ 0″ x 62′ 0″ x 20′ 0″ exclusive of the stage. The stage is 20′ 0″ x 40′ 0″ x 18′ 0″. The boys' dressing room is 21′ 0″ x 32′ 0″, and the girls' is 22′ 0″ x 33′ 0″. Chairs for the auditorium are stored under the stage.



FIRST FLOOR PLAN

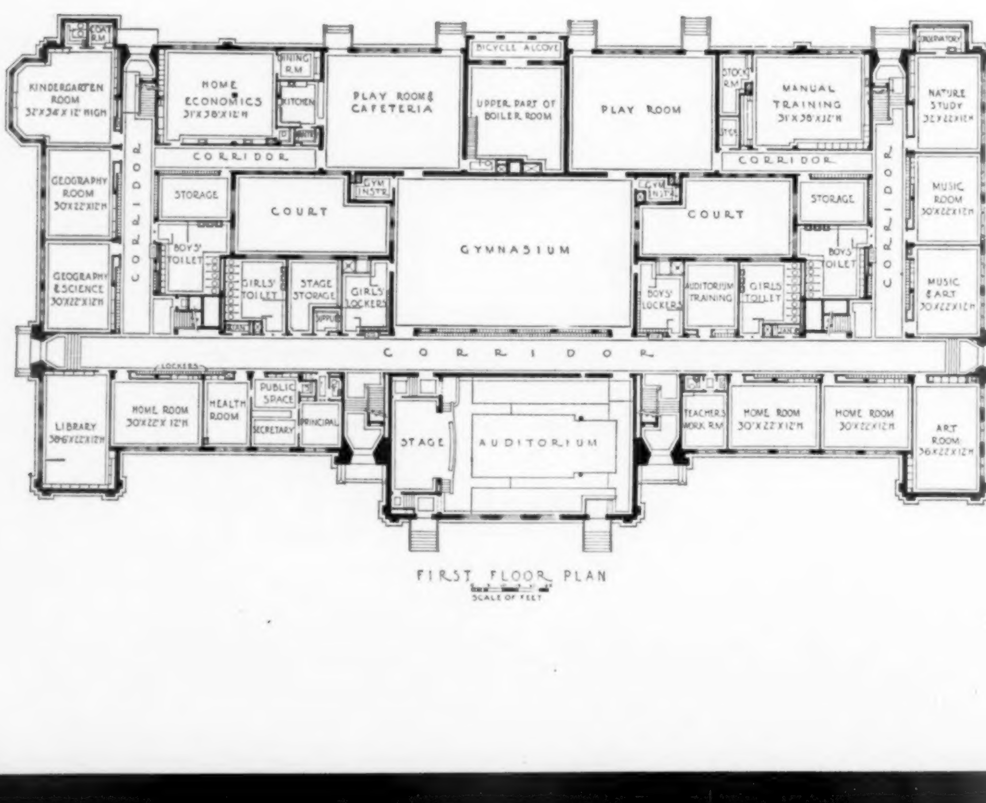
SCALE

George H. Jones, Architect, Portland.

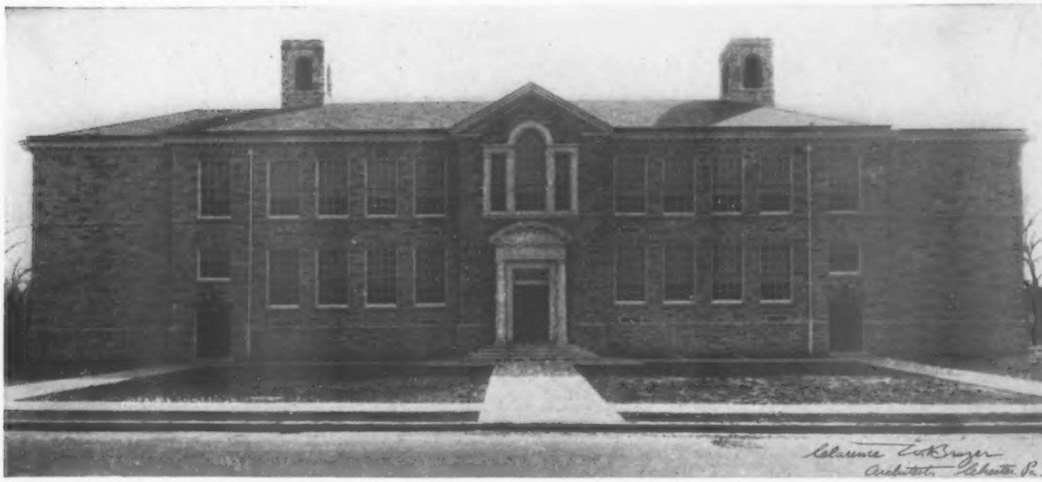
John L. Vestal School, Portland, Ore.

Completed in 1930 at a cubic-foot cost of 28.3¢, the building, ready for occupancy, cost \$331,000, \$11,281 being spent for movable equipment. The cost of improving the site was \$5,100.

The corridors are 12′ wide. The auditorium, which has a sloping floor and seats 491, is 63′ x 45′ x 23′. The stage is 15′ x 31′ x 28′ 6″. There are two indoor play rooms, one 39′ x 48′ x 12′ and one 39′ x 46′ x 12′. The latter is also used as a cafeteria. There is one gymnasium, 50′ x 79′ x 18′.



FIRST FLOOR PLAN

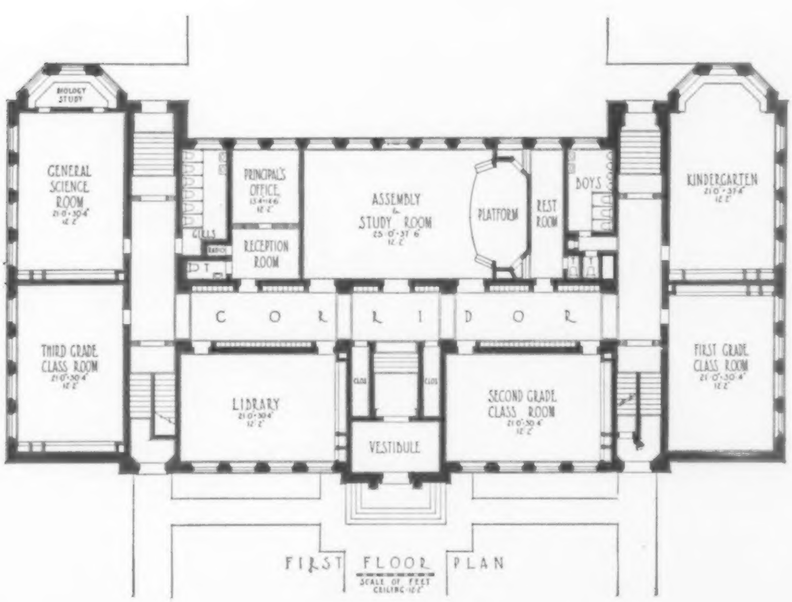


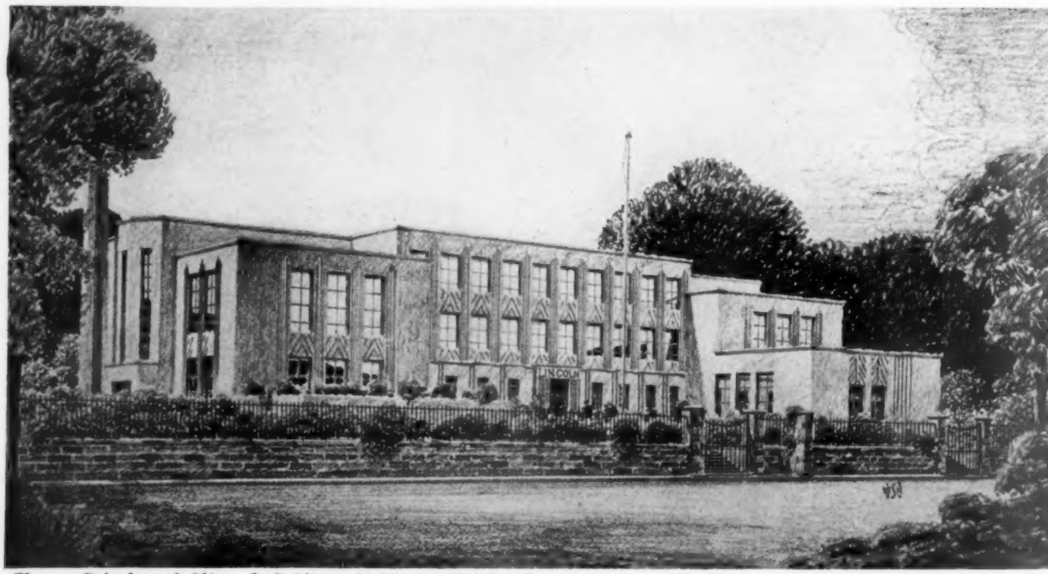
Clarence W. Brazer, Architect, Chester

John Wetherill School, Chester, Pa.

Construction was started in June, 1930. The cubic-foot cost was 43¾¢, the cost of the building being $164,360. Movable equipment cost $8,144, and improving the site cost $4,275.

Corridors are 9′ 6″ wide. The music and art rooms on the second floor are each 21′ 0″ x 30′ 0″ x 12′ 2″, and the nature study room is 21′ 0″ x 30′ 4″ plus a bay window. The assembly room exclusive of the stage is 25′ 0″ x 37′ 6″ x 12′ 0″. The floor is level and the seating capacity is 120. The stage behind the proscenium arch is 6′ 2″ x 21′ 0″ x 10′ 0″. The one dressing room is 6′ 6″ x 25′ 0″.



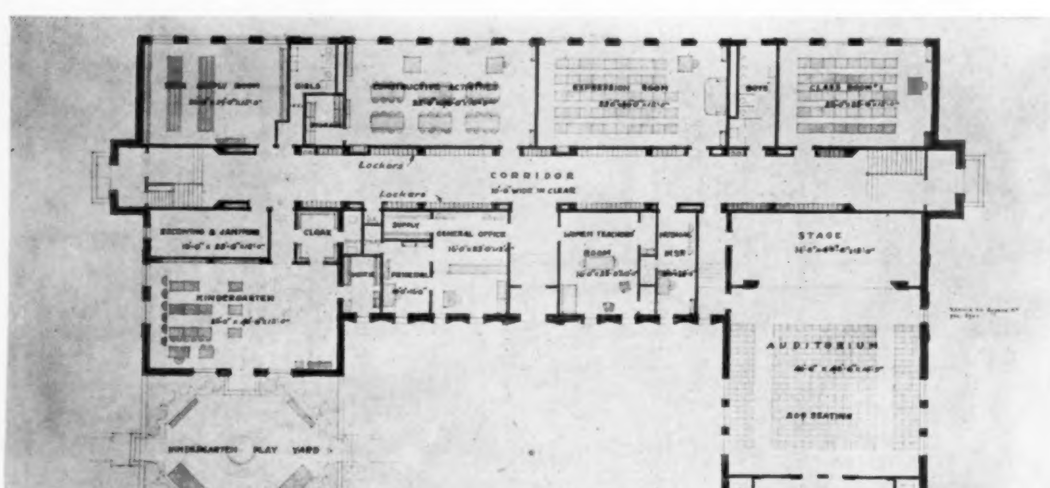


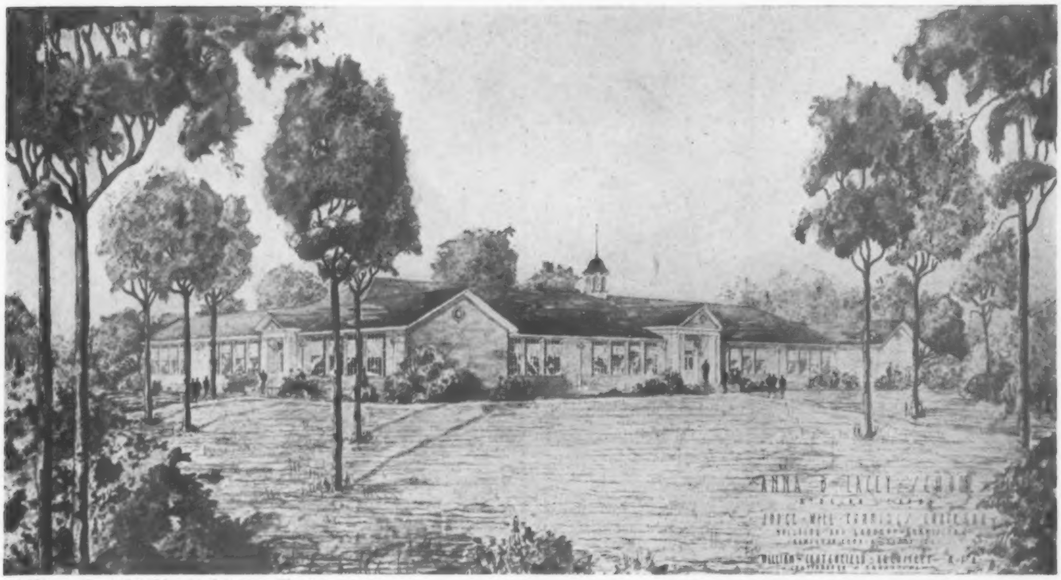
Thomas Pringle and Oliver J. Robling, Architects, Pittsburgh

Lincoln School, Pittsburgh, Pa.

Construction was begun in December, 1930, and is expected to take sixteen months. The estimated cubic-foot cost is 37.7¢. The cost of the building, which consists of three stories, is $264,569, the movable equipment cost $18,000 and improving the site $53,294. There are two playgrounds, one 22' x 31', the other 184' x 184'.

General classrooms are 22' 0" x 32' 0" x 12' 0". The art, community activities, music, nature study and mental deviate rooms are all 22' 0" x 40' 0" x 12' 0", which is also the size of the library. The two recreation rooms or gymnasiums are 34' x 40' 0" x 16' 0". The auditorium exclusive of the stage is 40' x 40' x 14' 9", and seats 209. The floor is sloping. The stage behind the proscenium arch is 16' x 40' x 14' 9".





William Crutchfield, Architect, Chattanooga

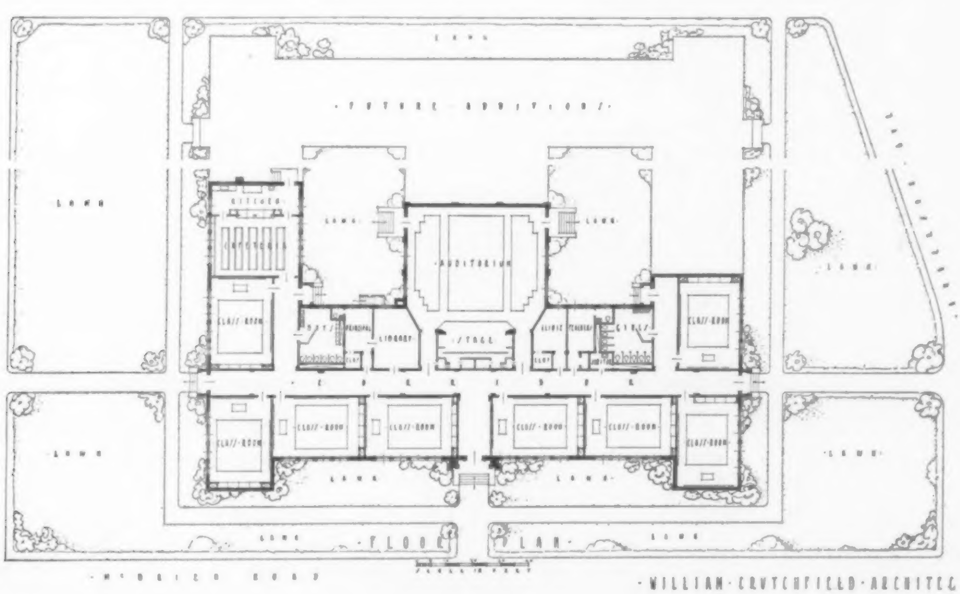
Anna B. Lacey School, Hamilton County, Tenn.

This one-story structure was completed in 1930 at a cubic-foot cost of 16¢. Improving the site cost $2,000, the building cost $51,887, and movable equipment $8,000. A plot plan is shown on page 210.

Corridors are 9′ wide. The following are the dimensions of the rooms:

Kindergarten—22′ x 31′ x 12′	Clinic—12′ x 22′ x 12′
Classrooms—22′ x 31′ x 12′	Teachers' room—10′ x 22′ x 12′
Library—17′ x 22′ x 12′	Principal's room—11′ x 22′ x 12′
Kitchen—11′ x 32′ x 12′	Auditorium—50′ x 43′ x 20′
Cafeteria—32′ x 21′ x 12′	Stage—16′ x 28′ x 18′

The auditorium, which has an inclined floor, seats 400. The two dressing rooms are each 6′ x 6′. A gymnasium and swimming pool are contemplated in future additions.



F. A. Naramore, Architect, Seattle.

Daniel Bagley School, Seattle, Wash.

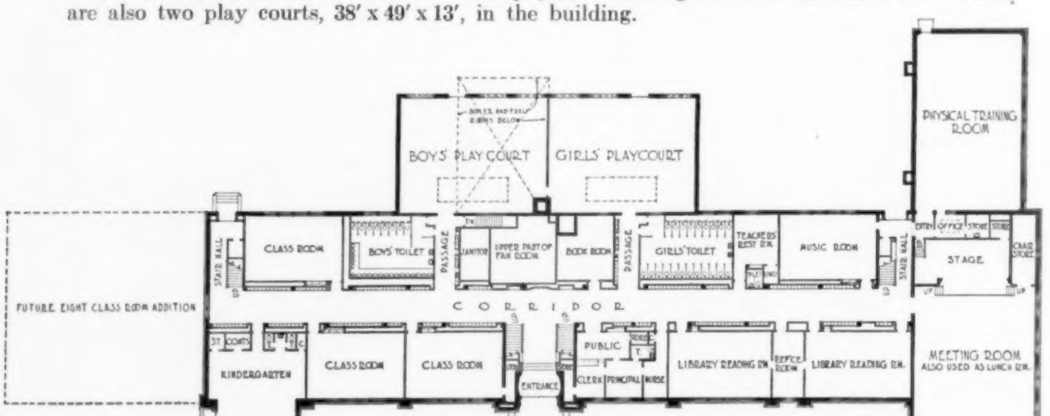
Construction was begun in April, 1930. The cubic-foot cost was 31½¢. The cost of the building was $220,000, and of movable equipment, $10,000.

Corridors are 11′ wide, and the following are the dimensions of the rooms:

Kindergarten—28′ x 40′ x 14′
Classrooms—22′ x 32′ x { 12′ 6″ / 14′ 0″ }
Home rooms—22′ x 32′ x 12′ 6″
Music room—22′ x 32′ x 14′
Library reading rooms—22′ x 34′ x 14′
Reference room—22′ x 11′ x 14′
Art room—22′ x 35′ x 12′ 6″
Work room between art room and science room—22′ x 11′ x 12′ 6″
Science room—22′ x 32′ x 12′ 6″

Classrooms on the first floor are 14′ 0″ high, while those on the second floor are 12′ 6″.

The meeting and lunch room is 40′ x 60′ x 18′, with a stage behind the proscenium 14′ x 31′ x 15′. The floor is level. When used as a meeting room, the seating capacity is 400; lunch tables are stored in the chair storeroom. Classrooms are used as dressing rooms. When used as a lunch room, the room accommodates 256; the additional folding meeting chairs are stored in the storeroom. The physical training room is 25′ x 60′ x 18′. There are also two play courts, 38′ x 49′ x 13′, in the building.



FIRST FLOOR PLAN

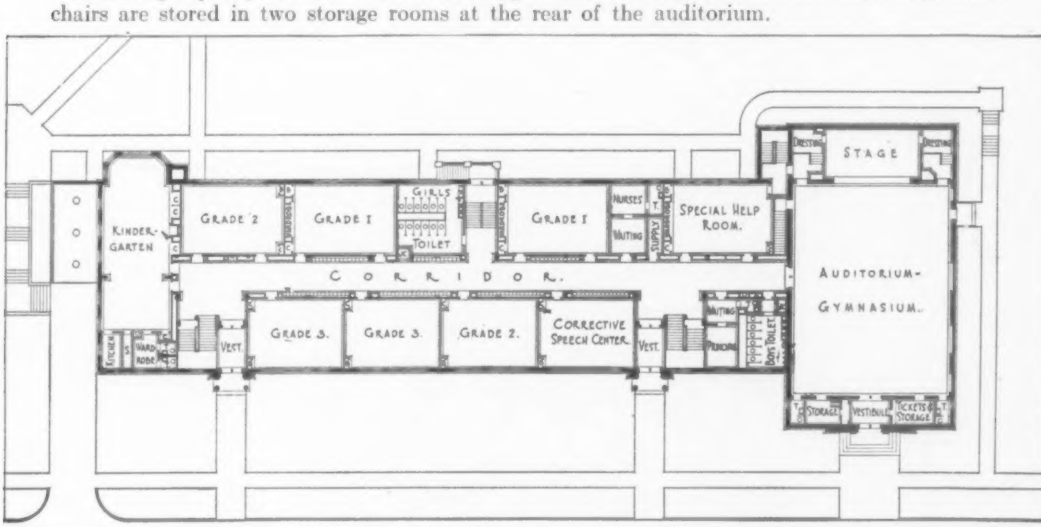
Law, Law & Potter, Architects, Madison, Wis.

Wilson School, Janesville, Wis.

The cubic-foot cost of the building, which was completed in 1930, was 26¢. Two thousand dollars was spent in improving the property. The building cost $200,683; the movable equipment, $7,500. There are two stories, with a ground floor under one section of the first story. All rooms are 12′ 2″ high. Corridors are 10′ wide.

On the first floor is the kindergarten, 22′ 0″ x 55′ 0″, a wardrobe, 7′ 8″ x 11′ 6″, a kitchen, 6′ 3″ x 11′ 6″, two classrooms each for Grades 1 and 2, and a special help room, each 22′ 1″ x 32′ 1″, as well as two Grade 3 rooms and a corrective speech room, each 22′ 1″ x 30′ 2″. The second floor contains two classrooms each for Grades 4, 5 and 6, 22′ 1″ x 30′ 2″, and two rooms for Grade 7, 22′ 0″ x 30′ 8″, one room for Grade 7, 21′ 1″ x 30′ 8″, a library, 22′ 1″ x 30′ 2″ and a music room, 22′ 1″ x 30′ 1″.

The auditorium-gymnasium is 50′ 0″ x 66′ 5″ x 25′ 6″, with a stage 15′ 7″ and 30′ 2″ x 19′ 0″. The seating capacity is 550. The two dressing rooms are each 10′ 0″ x 15′ 0″. The auditorium chairs are stored in two storage rooms at the rear of the auditorium.



FIRST FLOOR PLAN

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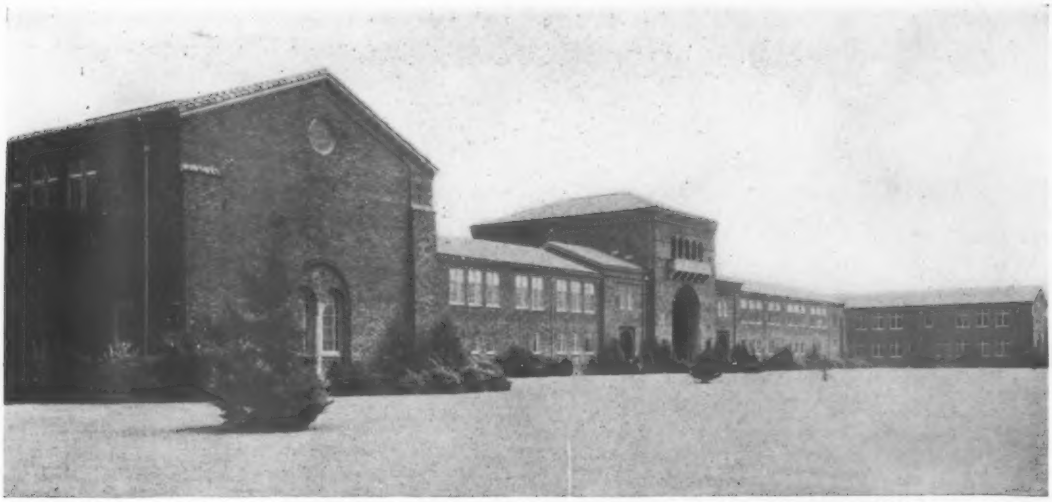
SCHOOLS FOR WHICH PLANS AND STATISTICS WERE EXHIBITED AT THE SECOND ANNUAL CONFERENCE OF THE NATIONAL ADVISORY COUNCIL ON SCHOOL BUILDING PROBLEMS

City and State	Name of School	School Superintendent	Architect
New England Region			
Greenwich, Conn.	Cos Cob	Edwin C. Andrews	Guilbert & Betelle
New Britain, Conn.	Benjamin Franklin	Stanley H. Holmes	Warren S. Holmes
South Cabot, Vt.	Cabot	Max W. Barrows	....
Wellesley, Mass.	L. Allen Kingsbury	S. Monroe Graves	Benjamin Proctor, Jr.
Winchester, Mass.	Wyman	James J. Quinn	Kilham, Hopkins & Greeley
New York Region			
Glens Falls, N. Y.	Broad Street	A. W. Miller	Tooker & Marsh
Kenmore, N. Y.	Lindbergh Elementary	F. C. Densberger	Benning C. Buell
Mount Vernon, N. Y.	School No. 16	Wm. H. Holmes	Warren S. Holmes
Rochester, N. Y.	Frank Fowler Dow	Herbert S. Weet	Francis R. Scherer
Syracuse, N. Y.	Washington Irving	G. Carl Alverson	Randall & Vedder
Middle Atlantic Region			
Baltimore, Md.	Canton	David E. Weiglein	Wyatt & Nolting
Bradford, Pa.	Hobson Place	James F. Butterworth	T. K. Hendry
Chester, Pa.	John Wetherill	David A. Ward	Clarence Brazer
Montclair, N. J.	Bradford	Frank G. Pickell	Starrett & Van Vleck
Newark, N. J.	Bragaw Avenue	John H. Logan	Frank Grad
New Castle, Pa.	Arthur McGill	Clyde C. Green	The Thayer Co.
Passaic, N. J.	Memorial	Fred S. Shepherd	John Kelly
Philadelphia, Pa.	Clara Barton	Edwin C. Broome	Irwin T. Catharine
Pittsburgh, Pa.	Lincoln	Ben G. Graham	Thomas Pringle & Oliver J. Robling
Reading, Pa.	Tyson Schoener	Amanda E. Stout	Muhlenberg Bros.
Wilmington, Del.	Mary C. I. Williams	S. M. Stouffer	Guilbert & Betelle
Wheeling, W. Va.	Madison	D. B. Kraybill	Frederick Faris
South Atlantic Region			
Atlanta, Ga.	Capital View	Willis A. Sutton	G. Lloyd Preacher & Co., Inc.
Bennettsville, S. C.	Bennettsville Primary	John G. Kelly	H. D. Harrell
Birmingham, Ala.	Norwood Elementary	C. B. Glenn	Warren, Knight & Davis
Fairfield, Ala.	Forty-Third Street	B. B. Baker	Denham & Denham
Winston-Salem, N. C.	Ardmore	R. H. Latham	Hall Crewes
Great Lakes Region			
Aurora, Ill.	C. M. Bardwell	K. D. Waldo	Jos. C. Llewellyn
Dayton, Ohio	Wilbur-Wright	Claude V. Courter	Herman & Brown
Detroit, Mich.	Clark	Frank Cody	McGrath & Dohman
Gary, Ind.	Lew Wallace	William Wirt	Wm. B. Ittner
Pontiac, Mich.	Longfellow	James H. Harris	Frank A. Childs
Rockford, Ill.	R. K. Welsh	Frank A. Jensen	Peterson & Johnson
Saginaw, Mich.	Handley	Chester F. Miller	Robert B. Frantz
South Bend, Ind.	Madison	W. W. Borden	Austin & Shambleau
West Lafayette, Ind.	Morton	F. A. Burtsfield	Walter Scholer
Central States Region			
Burlington, Iowa	South Junior High	W. G. Brooks	Wm. B. Ittner
Fargo, N. Dak.	Emerson H. Smith	J. G. Moore	Wm. T. Kurke
Hannibal, Mo.	Laura J. Pettijohn	L. McCartney	Malcolm S. Martin
Janesville, Wis.	Wilson	L. R. Creutz	Law, Law & Potter
Joplin, Mo.	West Central	J. A. Koontz	Felt, Dunham & Kriehn
Kansas City, Mo.	William Rockhill Nelson	George Melcher	Charles A. Smith
Lincoln, Nebr.	Clinton	Millard C. Lefler	Meginnis & Schaumberg
Madison, Wis.	West Junior-Senior	Richard W. Bardwell	Law, Law & Potter
Milwaukee, Wis.	Fernwood	M. C. Potter	Guy E. Wiley
Newton, Iowa	Emerson Hough	B. Conrad Berg	Proudfoot, Rawson, Souers & Thomas
Omaha, Nebr.	Jackson	J. H. Beveridge	F. A. Henniger & Son
St. Joseph, Mo.	Webster	F. H. Barbee	Eugene R. Meier
Two Rivers, Wis.	Joseph Koenig	Fred G. Bishop	Frank A. Childs
Tulsa, Okla.	Sequoyah	Merle C. Prunty	Leland I. Schumway
Waterloo, Iowa	Hawthorne	Charles B. Kline	M. B. Cleveland
Wichita, Kans.	Alcott	L. W. Mayberry	Glen H. Thomas
Winona, Minn.	Central	R. B. Irons	Boyum, Schubert & Sorenson
Gulf States Region			
Alexandria, La.	Rosenthal	W. J. Avery	Herman J. Duncan
Dallas, Texas	Roger Q. Mills	N. R. Crozier	Bryan & Sharp
Fort Smith, Ark	Trusty	J. W. Ramsey	Dwight H. Perkins
Hamilton County, Tenn.	Anna B. Lacey	Arthur L. Rankin	Wm. Crutchfield
Houston, Texas	Wharton	E. E. Oberholtzer	Harry Payne
Jackson, Miss.	Whitfield	E. L. Bailey	C. H. Lindsley
Knoxville, Tenn.	Brownlow	H. P. Shepherd	Barber & McMurray
Little Rock, Ark.	Forest Park	R. C. Hall	Thompson, Sanders & Ginocchio
New Orleans, La.	Martin Behrman	Nicholas Bauer	E. A. Christy
San Antonio, Texas	Woodlawn, No. 34	B. W. Hartley	Atlee & Ayers, and Phelps & Dewees
Western Mountain Region			
Crescent, Utah	Crescent	D. C. Jensen	Ashton Evans
Dayton, Wyo.	Dayton Public	A. A. Davidson	Everett E. Shore
Denver, Colo.	Bryant-Webster	A. L. Threlkeld	G. Meredith Musick
Portland, Ore.	John L. Vestal	Charles A. Rice	George H. Jones
Seattle, Wash.	Daniel Bagley	Worth McClure	F. A. Naramore
Wenatchee, Wash.	Stevens	G. Martin Warren	L. Solberg
Sierra Nevada Region			
Los Angeles, Calif.	Third Street	Frank A. Bouelle	A. S. Nibecker, Jr.
Pasadena, Calif.	Daniel Webster	J. A. Sexson	Building Department of Pasadena
San Diego, Calif.	Sherman	Walter R. Hepner	Quayle Bros.
San Francisco, Calif.	Lafayette	J. M. Gwinn	John Reid
San Jose, Calif.	M. R. Trace	Walter L. Backrodt	W. H. Weeks
Sierra Madre, Calif.	Sierra Madre Elementary	Elizabeth Steinberger	Herbert J. Powell
Tucson, Ariz.	Sam Hughes	C. E. Rose	Roy Place



THE MAIN BUILDING OF THE SACRAMENTO JUNIOR COLLEGE, SACRAMENTO, CALIF.

Meeting Modern Needs with Well-planned Junior Colleges

BY JAMES M. WOOD
PRESIDENT, STEPHENS COLLEGE, COLUMBIA, MO.

THE twentieth century has seen many changes in the school system of America. The curriculum of the elementary schools which deals primarily with the skills of learning has been entirely rewritten. The schools of the university which are concerned primarily with the techniques of a profession have altered in many ways, not only the curriculum content, but the method of instruction and the general objectives of the school.

Between the skills of the elementary and the techniques of the professional school lies a third field, which at the present time is receiving major attention from educational leaders. This field deals with the problems of general education. Attempts to adapt this program more closely to community needs have given birth on the one hand to the Junior High School and on the other to the Junior College. The former replaces the old seventh and eighth grades with enriched curriculum and a teaching program adapted especially to the needs of early adolescence. The latter has as its objective the completion of the work of general education and the meeting of the entrance requirements of the various professional schools in the universities.

Growth of the Junior College

The Junior High School has in every instance developed as a part of a public school system. The Junior College has sprung from three sources. In some instances it is an upward extension of the courses in a local high school in response to community demands. In other cases, it is an institution on private foundation or under denominational control. It may have been a liberal arts college that has discontinued the work of its junior and senior years, or it may have been a preparatory school that has extended its curriculum to cover the freshman and sophomore years of college work. In the third place, a university may have segregated its freshman and sophomore courses and organized them under the term "college" or "junior college."

In 1930 there were 430 junior colleges in the United States, with a total enrolment of more than 67,000 students. Public junior colleges increased 95 per cent between 1914 and 1928, while private junior colleges increased 65 per cent in the same period, reaching a total of 382 in 1928. The Department of Superintendence of the National Education Association adopted the following resolution at its 1929 convention: "Convinced by the amazing increase in enrolment of the colleges and universities that our people are awake to the need of school training beyond the age of childhood, we commend the addition of junior colleges as an integral part of the public school system. . . ."

Sacramento, Calif., offers a good example of a well-equipped public junior college. The Sacra-

mento Junior College was established in 1916 as a department of the High School. In 1922 it was separated from the High School and was placed under the control of a Junior College Board of Education. In 1924 the district voted a bond issue to purchase a separate location, and in 1926 the College moved to its new site of 61 acres on Freeport Boulevard, opposite the William Land Park. The College has a student body of slightly more than 1,740 and a faculty of 72.

The Sacramento Junior College Plant *

A central building for administration contains twenty-four classrooms and lecture rooms, twelve laboratories, twenty-four offices, the art department and the library. Two wings connected with corridors are used for the sciences and engineering. Offices are provided in the main part of the building for the president, the deans of instruction, extra-curricular activities, women, and men, and for the registrar comptroller. There are also conference rooms where instructors may meet students or may work undisturbed. One room, equipped with a small stage, is devoted to dramatics and public speaking. Another room is set aside for student-body officers. The building is adequately provided with locker, storage, waiting, rest and lavatory rooms.

Four separate units include a music building; an art building; a combined auditorium-gymnasium; and a combined bookstore and cafeteria. The equipment in all departments is modern and adapted to college work. Listed below, in alphabetical order, is a brief description of each department.

Animal Biology, Art and Chemistry

The ***Department of Animal Biology*** occupies the second floor of the south wing of the college building. The lecture room accommodates 80 students, and is equipped with modern projection apparatus and facilities for darkening and ventilation. Adjoining the lecture room are offices and a conference room. Of the two laboratories, one is well equipped with dissecting and compound microscopes for zoological work, the other with modern apparatus for work in animal physiology. A storeroom and a separate museum room provide for storage of all materials, models and charts, and for a growing museum.

The ***Art Department*** is situated in the central building, occupying the entire floor above the main entrance, as well as the small building situated at the left of the main drive, east of the music building. The department is well equipped with slides, casts, still-life and special apparatus. There are special rooms for lectures, studios, and general workshops, as well as recitation rooms.

The ***Chemistry Department*** occupies the upper floor of the north wing and consists of three laboratories, one each for general and qualitative, and for quantitative and organic chemistry; a balance room with 20 modern analytical balances; a storeroom; a dark room conveniently arranged for spectroscope, polariscope and photography; an office and conference room; a research laboratory for original experiments and lecture preparation; and a lecture room. The rooms are completely equipped with water, gas, vacuum pressure and electricity.

Engineering and Geology Departments

The ***Department of Engineering***, situated on the lower floor of the north wing, consists of a large drafting room and a classroom and instrument room. The drafting room is equipped with the accessories usually found in the best engineering offices—polar planimeters, pantograph, beam compass, stadia, and ordinary slide rules and calculating instruments. The Department is equipped with a sufficient number of high-grade engineer's transits, levels, hand levels, plane tables with telescopic alidades and surveying accessories, so that each student may be given thorough practical experience in the handling and use of these instruments in engineering work.

The ***Department of Geological Sciences*** is in the north wing. It consists of a lecture room, a mineralogical and petrographic laboratory and a supply room. The laboratory is equipped with water, gas, compressed air, electricity and the necessary chemical and physical equipment, including petrographic microscopes for determinative work. A rock-grinding machine is at the disposal of properly qualified students of petrography. In addition there is a comprehensive collection of minerals and rocks for reference purposes. The lecture room is suitable for full classes in mineralogy or geology. The lectures in mineralogy and geology are illustrated by typical minerals, rocks and fossils as well as by maps, instruments and models.

The Library and Music Building

The ***Library*** is in the north wing of the central building, opposite the main offices. There are four reading rooms and a workroom. It has a collection of 12,500 books, 250 maps and charts, and 2,000 pieces of sheet music. It includes material on the subjects of philosophy and psychology, sociology, economics and government, the sciences, history, literature, language, art, and music, as well as general reference books and periodicals. Several hundred books in foreign languages—French, Spanish, German, and Italian—have recently been added. The resources are greatly augmented by loans from the State Library, a reference collection of 200,000 volumes, and from the City Library; both render unlimited service to students through the Junior College library.

The ***Music Department*** is in a special building located opposite the cafeteria. It has three large studios, several smaller practice rooms, offices and storerooms with cabinets for the filing and classification of music and phonograph records. The equipment includes grand and upright pianos, practice claviers, a phonograph, violas, cellos, string basses, oboe, bassoon, clarinets, mellophones, baritone, tuba, tympani, orchestral bells, drums and traps, as well as a large collection of phonograph records and a representative library of music and books.

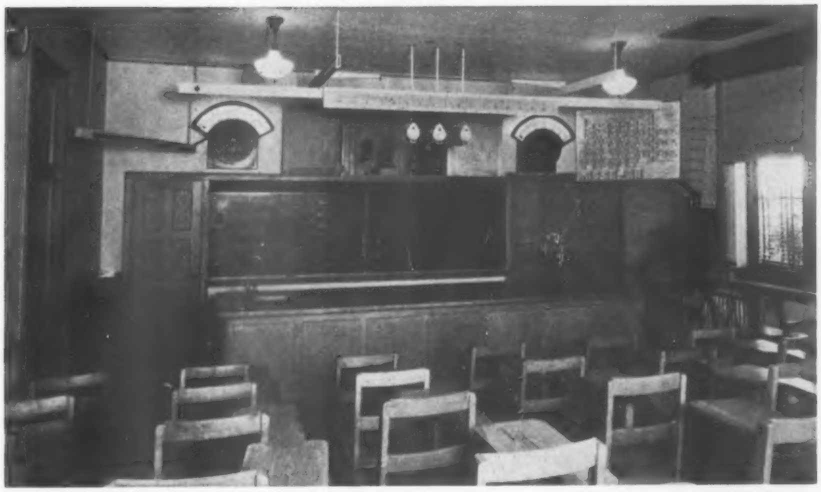
The Physics Department

The work of the ***Department of Physics*** is carried on in the north wing of the Junior College building. The whole lower floor is devoted to physics, and consists of a lecture room having a seating capacity of 75, two main laboratories, a dark-room, a research room, an apparatus and supply room, an office and workshop. The lecture room is provided with an inclined floor, equipment for darkening, a large projection lantern, and an adequate supply of special demonstration and

* The material about the Sacramento Junior College was supplied by President J. B. Lillard.

THREE INTERIOR VIEWS OF THE SACRAMENTO JUNIOR COLLEGE

The elementary Botany laboratory is shown at the right

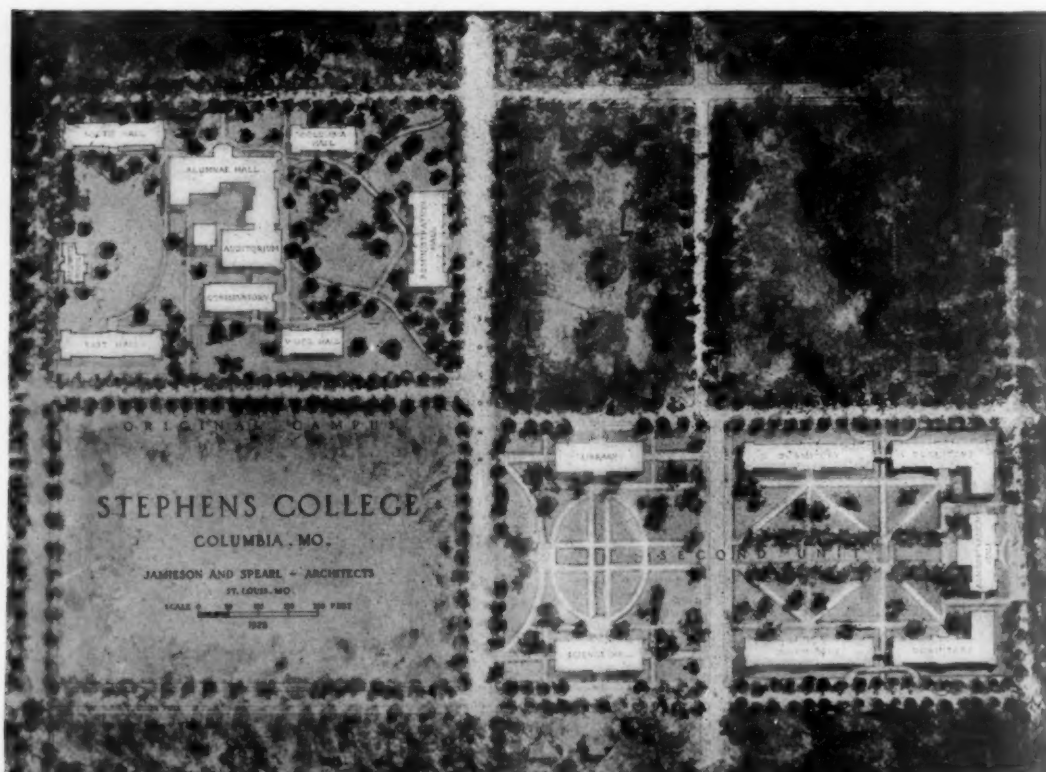


THE PHYSICS LECTURE ROOM

THE ELECTRICAL LABORATORY

NORTH HALL, A NEW DORMITORY AT STEPHENS COLLEGE, COLUMBIA, MO.

projection apparatus. One of the main laboratories is for work in mechanics and heat, and the other is for work in electrical measurements. The dark-room is for photographic purposes, spectrum analysis, and photometry. The research room is for the use of instructors and such qualified



THE CAMPUS PLAN OF STEPHENS COLLEGE

North Hall is the only building of the second unit yet erected. Its location is indicated in the plan above; it is the unnamed dormitory at the right of the library

students as might be assigned special research problems.

All laboratories and rooms are well supplied with gas, water, electricity and compressed air. Two hundred electrical outlets in various rooms are controlled from a central switchboard so that either direct or alternating current, at various voltages, may be supplied. A high-voltage transformer and a three-phase generator constitute special features of the electrical installation. Five large pillars of concrete embedded in the earth and extending up into the rooms form solid tables free from building vibrations. All apparatus, both for demonstration and general laboratory purposes, is of recent design, much of it having come from the shops of the best American and foreign instrument makers. No expense has been spared to provide adequately for a thorough and modern course in the various phases of physics.

Physical Education

The *Physical Education Department* is located in the gymnasium-auditorium building. This building has a gallery, a raised stage with curtains, scenery, a moving-picture machine and other equipment, which make it well fitted for social events, dramatic performances, community exercises, and general meetings. It is supplied with locker, exercise, examination, dressing and drying rooms; in addition it has a visiting-team room, special and general shower rooms, a rest room and offices. Its two main floors are ample for regular class work and indoor basketball and handball games. There are also two corrective exercise rooms. The equipment is modern and complete.

The athletic fields consist of tennis courts, baseball and football fields, a track, and a concrete stadium seating 25,000. An excellent open-air amphitheater provides for the staging of athletic and gymnastic events, concerts and artistic spectacles of all kinds. The William Land Park opposite the college has a nine-hole golf course, and several baseball and other athletic fields, besides a riding course with available horses. Just beyond the Park are the Riverside Baths, which are likewise available to students at reduced rates.

Plant Biology Department Equipment

The *Plant Biology Department* occupies the lower floor of the south wing. Its large general laboratory, with north exposure, is equipped with well-designed laboratory tables, several wall cases and a 16-foot demonstration table with water, gas, and electrical connections. The lecture room, which seats about 70 students, has excellent facilities for projection work: light-proof shades, fan ventilators, and electrical connections in front and rear of the room. There is also a greenhouse which furnishes material for plant-physiology experiments and for the study of plant structure. In it is a cement-lined pool which makes possible the cultivation of aquatic forms.

In addition to the rooms mentioned, the Department has a physiological laboratory, a dark-room, a research laboratory, an office, a combined library and herbarium with herbarium cases and with glass cases for museum specimens, and a storeroom. The supplies and equipment for the courses offered include, besides the ordinary equipment, apparatus for micro-projection, a lantern slide and opaque projection outfit, a daylight and an aluminum screen, binocular wide-field microscopes, sliding and rotary microtomes, charts, models, and plant-physiology apparatus.

Private Junior College Students Reside at the College

The basic difference between the public and private junior college is that the students of the latter as a rule live in dormitories and are under the control and direction of the faculty at all times during residence. A typical institution of this type is Stephens College, a junior college for women at Columbia, Mo.

Stephens College

Stephens College has a student body of 630 and a faculty of 60. It was one of the first colleges to accept the standardization of the University of Missouri, in 1914, whereby students taking the subjects required by the University were admitted to full junior standing there. Students are now given full credit in all the leading universities and colleges of the United States. In 1926 the North Central Association of Colleges and Secondary Schools designated Stephens College as an experimental school under its supervision. At the same time it granted the college permission to establish a four-year junior college.

A VISTA OF THE LIVING ROOMS IN NORTH HALL

The Stephens Campus

The campus of Stephens College contains 165 acres. As shown in the accompanying plan, it consists of two units. Of the second unit, North Hall, the new dormitory, is the only building yet erected. The buildings on the original campus include an Administration Hall, an auditorium, a

conservatory, five residence halls (Alumnae, Wood, Columbia, South and East) and the President's House. The Infirmary is now located on the second unit where the library building will ultimately be located. The library is now housed on the ground floor of North Hall, together with the study-hall. The former library building on the same square as the infirmary, is now the Home Economics Building.

The Administration Building

The Administration Building was opened in 1923. On the first floor are the offices of the president, the dean of the faculty, the chairman of the board of deans, the board of curators and the business offices. On the second floor are classrooms; on the third floor are the art studios and science laboratories.

A Typical Residence Hall

North Hall, the new dormitory on the second campus unit, is 217 feet in length with an average width of 48 feet. It is five stories high, the outside walls being of red brick with Bedford stone trim. The central part of the building forms a tower which has a parapet wall eight feet in height, the enclosed space to be used for sun baths. The construction throughout is fireproof. The building houses 191 students and the faculty residents. The parlors, with bookshelves and fireplaces, open on each side of the entrance hall. The students' rooms are arranged in suites of two rooms with connecting bath. Each room has two large closets.

The Stephens Country Club

The Country Club grounds consist of 142 acres of desirable land. On them are situated the Stephens Country Club and the College Athletic Club. The Athletic Club, under the direction of the Department of Physical Education, is used for week-end rest periods and as a center of camp activities.

The Country Club is used for breakfast and dinner parties of student groups, and for week-end parties. Each of the sororities holds its annual reception there. It is the center of formal social life. On the club grounds is a well-arranged nine-hole golf course, which is used exclusively by the student body and faculty members of the college. The bridlepaths, for the use of the Stephens students in the college riding academy, wind around the hills.

KFRU

Stephens College maintains a broadcasting station. KFRU is a 500-watt station, with a wave length of 475.9 meters. Musical programs and talks are broadcast during the week by the faculty and students of the Music and Dramatic Arts Departments.

Junior Colleges Are Being Closely Observed

The development of junior colleges in all parts of the country is being watched with intense interest by foresighted educators, who see in them the solution of some of the problems of providing a general education preparatory to the specialized work of university professional schools.

Reducing Noise in School Buildings

Acoustic Correction for Rooms, Corridors and Auditoriums

By F. R. WATSON

PROFESSOR OF EXPERIMENTAL PHYSICS,
UNIVERSITY OF ILLINOIS

THE disturbing effects of noise have been known for many years, but only recently have scientific studies revealed the nature of the evil. D. A. Laird, in a summary of experimental literature, writes that noise has generally a harmful effect on people: it influences the body functions and affects mental activities and the nervous system.[1] "Relaxation," he reports, "is difficult, if not impossible, in a noisy environment."

School children are especially susceptible to the harmful effects of noise, so that quiet conditions in school buildings appear more necessary than elsewhere. It is the purpose of this article to discuss the means by which noise may be reduced and to show that it is not sufficient merely to quiet rooms and corridors. Walls and floors should be soundproofed, machinery of all kinds should be adjusted to reduce vibrations and noise, and ventilation pipes should be designed to reduce the transfer of sound.

Sources of Sound

Consider first of all the sounds in school buildings: the voices of pupils and teachers; typewriters; musical instruments; machinery; elevators; and possibly other agencies. Each of these presents a problem, with the necessity of devising some means of acoustic control whereby classes may be carried on and instruments may function in the proper manner but without disturbance to the occupants of the building.

[1] "The Effects of Noise," *Journal of the Acoustical Society*, vol. 1, pp. 256-262 (1930).

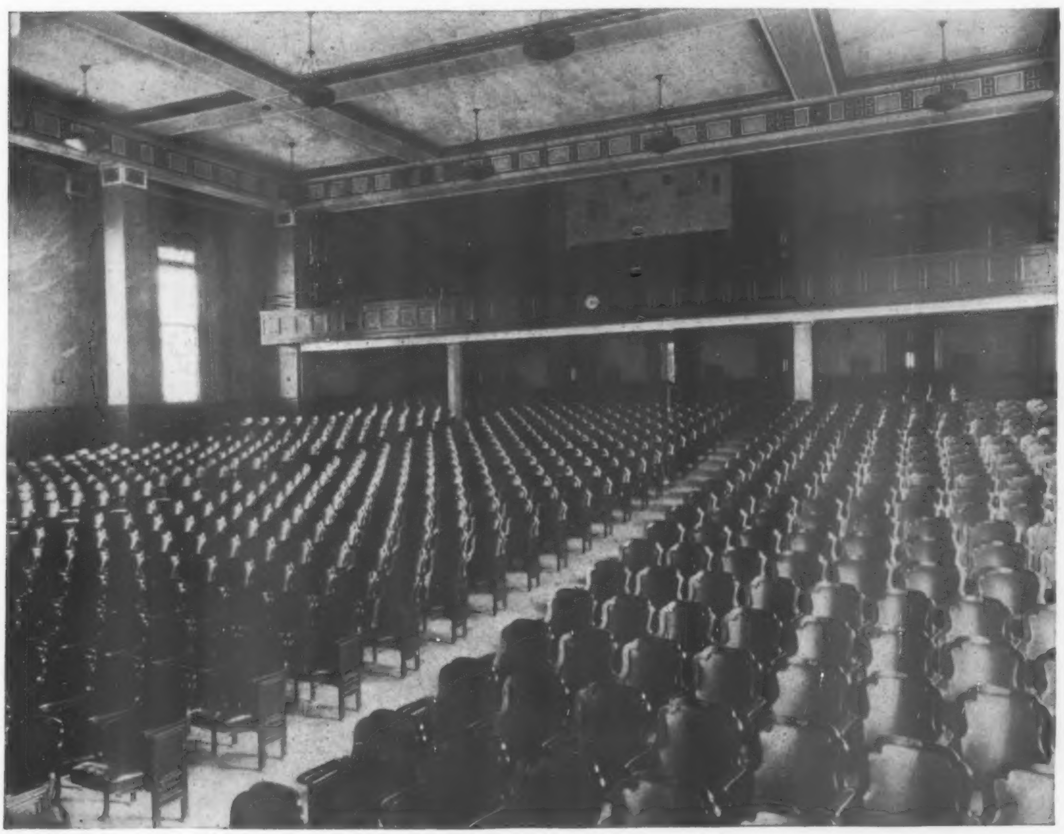
How to Quiet a Room

Any sound generated in a room—speaking, for example—spreads out in spherical waves from its source until it strikes the boundaries of the room. Here the sound is reflected, but with some absorption and transmission, after which it passes to a second surface, where it is again reflected and absorbed, and so on until it becomes inaudible. If the walls are constructed of the usual hard plaster, only a small portion of energy is absorbed at each reflection, so that several hundred such reflections may take place before the sound dies out, and several seconds of time may elapse before it becomes inaudible. In the meantime, other sounds are spoken and mix with the earlier ones; this produces a

Courtesy U. S. Gypsum Co.

FIG. 1. A CLASSROOM QUIETED BY SOUND-ABSORBING MATERIAL PLACED ON THE CEILING

Pupils and teachers are free from the nervous disturbance of excessive and confusing sound



Courtesy American Seating Co.

FIG. 2. AUDITORIUM QUIETED BY CEILING TREATMENT

Upholstered seats aid in securing quiet, and also add to the comfort of pupils

confusion in hearing. The correction lies in reducing the number of reflections by means of absorbing-material placed on the walls.

Correction of Rooms a Matter of Certainty

The acoustic adjustment of rooms is now a matter of scientific certainty. What is done is to make use of the equation developed by Professor Wallace Sabine, of Harvard: $t = .05\,V/a$, where t is the time of reverberation taken for a standard sound to die out, V is the volume of the room in cubic feet, and a is the absorption of all the surfaces and articles in the room. Ordinarily, rooms are too reverberant; that is, the time, t, is too great because plaster, glass and wood, the usual surfaces in a room, absorb only about three per cent of the sound falling on them. By installing special materials which absorb from 20 to 80 per cent, the sound dies out more rapidly and the acoustic defects disappear. It is necessary to add enough material to reduce the time of reverberation to 2 seconds, or less, depending upon the volume of the room.

Classrooms

While the general method of correction follows the procedure just described, it is found in practice that different types of rooms require different treatment. Classrooms, for example, which are usually of simple rectangular shape and in which only speaking and singing take place, are easy to adjust. Absorbing-material placed on the ceiling and upper walls is of great benefit, both pupils and teacher being relieved of the nervous disturbance from excessive and confusing sounds.

School Auditorium

The school auditorium, on the other hand, presents a different problem. The stage in this case should be equipped with several reflecting surfaces so that the speaker or singer can "hear himself." Such an arrangement allows sound to be generated most perfectly. The auditorium itself, however, should be deadened considerably to give the best conditions for listening. Upholstered seats in rooms are an aid in securing quiet, and if properly designed, they add to the comfort of auditors.*

Offices and Corridors

Other types of rooms require still different treatment. An office with typewriters and telephones requires greater quieting than a classroom. It is desirable, when possible, to group typewriters by themselves in a separate room. Rooms used for conferences should also be very quiet. Corridors in school buildings are usually noisy, because of the unrestrained laughter and talking of pupils. Material on the ceiling of such corridors noticeably reduces the disturbing effect of such sounds.

The foregoing brief discussion indicates the method by which rooms may be quieted according to modern acoustical theory. Further examples, given in considerable detail, may be found in separate treatises.[2]

Sound Insulation

A problem that is equally important and more difficult of solution than the acoustics of rooms, is the soundproofing of walls and floors. For example, pupils singing in one room will disturb the occupants of adjoining rooms unless the walls are built so as to reduce the intensity of the transmitted sound. The same is true of the noise of machinery in the basement of the building; in this case it is necessary to construct a floor capable of withstanding the passage of the disturbing sound.

How Sound Is Transmitted

Sound is transmitted through a wall in three ways. First, it proceeds easily through any continuous air passages, such as ventilation ducts, holes around pipes, etc. Unless these openings are closed, any attempt at soundproofing is a waste of effort.

Second, the pressures and rarefactions of sound waves strike a wall and cause it to vibrate and set up sound waves on the further side. If the wall is in tune with the incident waves, the vibration set up is larger, and more energy is transmitted. Generally speaking, a massive, stiff wall is less likely to vibrate than a thin, flexible one; but the problem of a practical, effective soundproof wall has not been entirely solved.

* School Posture and Seating, by H. E. Bennett. Ginn & Co., 1928.

[2] Acoustics of Buildings, by F. R. Watson, John Wiley & Sons, 1930; Acoustics of Buildings, Davis and Kaye, Bell & Sons, 1927.

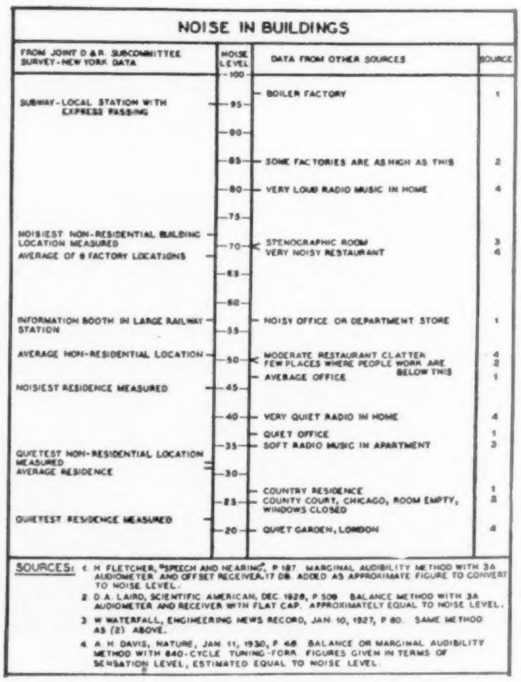


FIG. 3. A LOUDNESS SCALE

In the third type of sound transfer, of little importance compared with the first two, is the back-and-forth vibration of air particles as they transmit sound waves and are communicated to the wall particles; these wall particles in turn pass the vibrations on to the air particles on the far side of the wall. Little energy is transmitted by this method, however, because the wall particles are usually massive compared with the air particles, and consequently most of the incident energy is reflected.

Loudness of Sound

To understand how much a partition reduces sound, it is first necessary to get a conception of the modern explanation of loudness. The normal ear acts in an interesting manner; it can easily detect a very faint sound, but as the intensity increases, a sort of mechanical brake protects the ear from very loud sounds. In scientific terms, it responds very nearly to the logarithm of the intensity instead of the intensity itself.

The following table is intended to show the loudness units, used by acoustic engineers, that correspond to the action of the ear.

Intensity (I)		Loudness—10 logarithm (I)	decibels
1	(threshold sound)	10 lg 1	= 0
10	(threshold units)	10 lg 10	= 10
100	"	10 lg 100	= 20
1,000	"	10 lg 1,000	= 30
:		:	
1,000,000	"	10 lg 1,000,000	= 60
:		:	
1,000,000,000	"	10 lg 1,000,000,000	= 90

A threshold sound which is just inaudible has an intensity of 1 unit and a loudness 0; a sound with 10 times the threshold units has 10 decibels loudness, etc. The ear can just detect the difference between two sounds that differ by one decibel. According to this acoustic scale, various sounds have been measured, as shown in Fig. 3.

Reduction of Sound by Partitions

Suppose a sound of 60 decibels loudness (intensity—1,000,000) in one room is transmitted through a partition with a reducing factor of 30 decibels (30 db.). The sound will be reduced by 30 decibels to a level of 30 db. That is, while the intensity is reduced from 1,000,000 units to 1,000 —a thousandfold reduction in intensity, the loudness is reduced only one-half. If the initial sound is 80 db., as in the case of a loud radio, the transmitted sound will be reduced 30 db. to a level of 50 db. In the latter case, the transmitted sound is loud enough to be disturbing. Sounds should be reduced to 30 db. or less if they are to be unobjectionable. An efficient partition, therefore, should have a reducing value of at least 30 db.[3]

Reduction of Noise and Vibration by Machinery

Many machines are noisy, and some means of controlling them is desirable. Where a machine is out of balance, it is likely to set up vibrations in the supporting floor that become noticeable. The interposition of padding, steel springs, etc., between the machine base and the floor is sometimes helpful, but the outcome is not always certain. It appears necessary to adjust the strength of the spring to suit the particular conditions. Enclosing a noisy machine will be beneficial in confining the disturbing sound. High-velocity fans and machines are much more noisy than those with slow motion.

Transfer of Sound by Ventilation Ducts

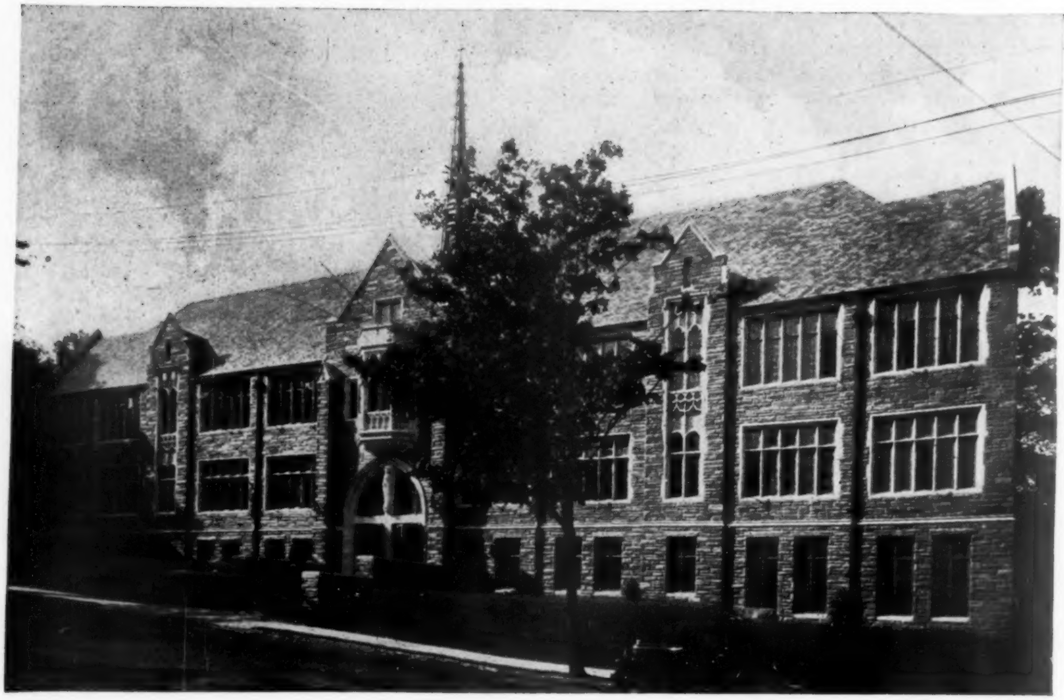
A ventilation duct transmits sound like a speaking tube. The sound waves are confined by the sides of the tube and proceed easily with but little loss from one part of the building to other places reached by the pipes. To correct the difficulty, it is necessary to reduce the sound, while still allowing the air to flow. This is accomplished by devices that take advantage of the fact that sound waves have a wave motion, while the flow of air is a bodily movement of the air forward in one direction. Baffle-plates of sound-absorbing material are useful in this connection; it also helps to line the duct with such material. Long, narrow pipes transmit less sound than short, large ones.

Construction Requirements for Good Acoustics

To have good acoustics a school building must be carefully planned and equipped. It must have robust floors and walls if the transmission of sound is to be controlled. Each room and corridor should have absorbing-material in correct amount to give satisfactory quiet. Machinery should be well balanced and of slow velocity; if not, the resultant disturbance may be reduced by padding, and by enclosing the machine.[4] Ventilation pipes should either be long and of small diameter, or else padded on the interior surface. The observance of these requirements will control most of the acoustic disturbance and make a reduction of other unavoidable noise.

[3] For a description of various constructions which increase soundproofing, see "Symposium on Sound-Insulation," *Journal of the Acoustical Society*, Jan., 1930.

[4] See the article on "The Installation of Sound-Picture Equipment" in Section VI.



A "First Class Type A" Fireproof School—St. Madeleine Sophie's School, Philadelphia

BY CHARLES E. DAGIT

HENRY D. DAGIT & SONS, ARCHITECTS, PHILADELPHIA, PA.

THE problem of designing a school which is practical in its plan, permanent in its construction and at the same time creative in its architectural treatment is not easy. Proper classroom lighting and ventilation, stairways, toilet facilities and the many other conflicting requirements of a modern school are difficult to combine in a harmonious, artistic architectural plan and elevation. English Collegiate Gothic of the thirteenth and fourteenth centuries was selected as the style for St. Madeleine Sophie's School and Chapel, which were to be located in a semi-suburban residential section of Philadelphia. Thus it was possible to avoid having a building of stereotyped school character.

In plan the building is T-shaped with the vertical member forming the Chapel wing. In the basement of the wing is a well-lighted gymnasium and auditorium, one side of which is at grade level, owing to the steep grade of the site. The horizontal member consists of classrooms, four on each floor. The advantages of the plan are evident at a glance. It provides a well-lighted, airy corridor on one side of the wing, and classrooms on the other. Stairways are at each end of the corridor, with the main stair hall in the center. Toilet rooms, conveniently located on each side of the Chapel wing, are entered through an open vestibule. This is a desirable feature, in that the toilets are not directly accessible from the corridor or the interior of the building.

The problem of lighting and ventilating the classrooms was solved in an artistic and practical manner. Heavy steel casements with leaded glass were used, lending a dignified and pleasing atmosphere to the exterior elevation. These casements, trimmed with Indiana limestone, carry out the vertical lines of the architectural motif, and give scale to its proportions without keeping out the daylight which is so essential to classrooms. In addition, the casements are conveniently and easily opened and closed, in contrast with the usual cumbersome sash windows.

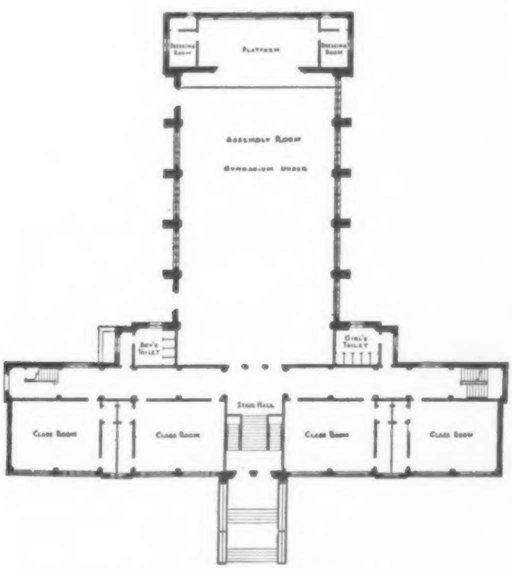
The exterior walls are faced with a mixture of Chestnut Hill stone and Foxcroft stone obtained from nearby quarries, and present a pleasant tone and texture of various shades of grey, blue

and brown. The expanse of stone wall is broken by Indiana limestone spandrels and trim about the doors and windows. Here unusually fine Gothic moldings and tracery windows have been employed to set off the delightful texture of the stone work and to relieve the simplicity of the façade.

The peaked roof is covered with a variegated mixture of grey and green slate, and above it rises an exquisite lead flèche, adding height to the building and dignity to its composition. The building is entirely fireproof from the basement to the pinnacle of the flèche. Constructed of reinforced concrete, stone and steel, it is strictly modern in every respect.

The great concrete arches and vaults which span the Chapel or Assembly Room and form its roof are one of the marvels of the modern science of building. The use of concrete is centuries old, but ferro concrete—stone, sand, cement and steel —opens new fields of design and treatment for the architect of today. The walls and ceilings of the Chapel are a huge monolithic concrete vault, supported by means of arches which form the ribs of the vault and divide the room into six bays 16 feet wide. The spring line of the arches is at the floor, and the two sides meet at the peak of the roof and form a pointed arch.

The concrete surfaces were left exposed after the removal of the form work. The vast surface of the vault and the huge arches are relieved by a modern Gothic polychrome decorative treatment of the arches, beams and purlins. The arch over the sanctuary of the Chapel was formed of limestone, adding a pleasant contrast to the concrete surfaces.



THE FIRST FLOOR PLAN

THE CHAPEL-ASSEMBLY ROOM OF ST. MADELEINE SOPHIE'S SCHOOL

The interior of the building is interesting in its finish and appointments. The stairs are reinforced concrete with treads of Alberene stone. The wrought-iron stair railings have a Swedish iron finish. The floors of the corridors are laid with terrazzo, and the walls of the corridor are wainscoted with buff-glazed tile, which is easily cleaned and maintained. The walls of the main entrance of the school are faced with Indiana limestone. All the woodwork is oak.

St. Madeleine Sophie's School and Chapel were economically constructed, owing to their compact plan and the complete elimination of waste space. The cost per cubic foot was 39½¢, excluding the plumbing, heating and electrical work. The cost of the building, including plumbing, heating and electrical work, exclusive of furnishings, was $220,-000. The building was constructed to last many years, and is classified as First Class Type A fireproof construction, the highest classification under the new Philadelphia building code. The insurance rate of twelve cents per hundred dollars is the lowest on any public building in the city, and is considerably lower than the rate on the public schools of Philadelphia.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Classroom Furniture—American Seating Co.
Doors—Roddis Lumber & Veneer Co.
Drinking Fountains, Plumbing Fixtures, Sanitary Equipment —Standard Sanitary Mfg. Co.
Heating and Ventilating Systems—Warren-Webster Co.
Valves—Sloan Valve Co.
Windows and Sash—J. S. Thorn Co.

The Plant Requirements of a Country Day School

BY N. L. ENGELHARDT

Professor of Education,
Teachers College, Columbia University,

and

THOMAS C. BURTON

Headmaster, The Staten Island Academy,
Staten Island, N. Y.

THE advantages of a boarding school without leaving home are offered the country day school pupil.

A review of the literature on this type of school, as well as an examination of the present practice of some two hundred country day and boarding schools, and a study of the tendencies in progressive "private" education in general, have been the basis for formulating the following "Objectives of the Country Day School":

1. Being in the country for study, work, and play.

2. Being near the city, with its activities and institutions available for study.

3. School and home cooperation for study, work, and play under expert guidance.

4. The long school day.

5. A large campus, with room to see and build and grow things, as well as to play.

6. A constructive health program to make the most of the environment for growth and development.

To a greater or less degree, nearly all schools professing to be country day schools offer these

AIR VIEW OF THE LAYOUT OF THE GILMAN COUNTRY DAY SCHOOL, BALTIMORE, MD.
This was the first country day school, being incorporated in 1897. The present plant dates from 1911

THE SCHOOL BUS AT SHORE ROAD ACADEMY, BROOKLYN, N. Y.
Calls for primary children in the morning and takes them home at the end of the day

children up to twelve years, particularly, it would be well to consider the full development of all twelve objectives.

The Campus *

The ideal campus for the country day and boarding school must be readily accessible to the homes of its day pupils, to a main highway, to a trolley or bus line, to mail and express delivery routes, to sewers and such public utilities as gas, electricity and water, and to such city institutions as libraries, museums, theaters, churches, hospitals, fire department, etc. Some of the pupils should be able to walk to school, although many will probably use public or school conveyances, or furnish their own transportation in private cars.

The environment should be progressive, intellectual, and inspiring, as well as healthy, safe from physical dangers of grade crossings or blind corners, and morally good. In a new residential

* For greater detail, see "Campus Standards for Country Day and Boarding Schools," by George D. Strayer, N. L. Engelhardt and Thomas C. Burton, published by the Bureau of Publications, Teachers College, Columbia University, 1930.

advantages. Building upon these features as a foundation, the more progressive country day schools are utilizing their obvious opportunity to augment still further the advantages offered their pupils. Among the additional objectives set by this smaller group of schools are:

1. An environment for more natural living, with freedom for initiative and self-expression.
2. Opportunity to develop, cultivate and capitalize pupil interests.
3. Teachers trained to discover, encourage and guide pupils' abilities into creative self-activity.
4. Individuation, seeking to give each child the education that best suits his needs, abilities, interests, and possibilities.
5. Character training by measuring achievement in terms of end results rather than methods and means.
6. Dynamic progressiveness.

Naturally, the latter objectives are less well achieved, and usually are incorporated only in programs planned for children from four years to twelve. Preparation for college entrance usually restricts the work of the last four years to more routine and conservative treatment.

It is desirable that before a country day school is built and begun, the patrons decide which and to what degree they want any or all of these objectives to govern the educational program in the new school—for the educational program determines the physical plant. In the case of schools for

NATURE STUDY IN THE OUTSKIRTS OF CLEVELAND
Pupils of the Hawken School, South Euclid, Ohio, in the woods near the school

THE FIREPROOF DORMITORY AT RIVERDALE COUNTRY SCHOOL, NEW YORK CITY
Many of the boys board at school during the week and spend the week-ends at home

district, especially if the area is restricted to homes of the better sort, these requirements are usually fulfilled. Located on the outskirts of a city, a country day school is remote from the noise, dirt, and distractions of traffic, industry, and business, yet is near enough to urban activities to be able to visit them easily. For the manufacturing, shipping and civic life of the city as laboratories for school study are no less desirable in connection with classes in geography, history, civics and sociology than are the fields and woods essential for the study and appreciation of the natural and physical sciences.

The table below is useful for estimating the minimum acreage necessary for schools of various sizes.

ESTIMATING MINIMUM AREA

Type of Pupils	Basis for Estimating on First 100 Pupils	Additional for Each 10 Pupils
Elementary day..	10 acres	1 acre
Secondary day...	15 acres	1 acre
Elementary boarding	20 acres	1 acre
Secondary boarding	25 acres	1 acre

The minimum acreage obtained in this manner is usually sufficient for the necessary playgrounds, apparatus, gardens, outdoor theater, lawn, and building sites. Such area should be contiguous and as nearly square as possible.

The best site is commanding in location, has at least half the minimum acreage level, has good natural drainage with good loam topsoil and sandy or gravelly subsoil, and is made up of natural woods, some body of water—lake, pond, or stream, as well as fields.

Landscaping should be simple and dignified, designed rather to bring out the beauty of the whole school plant than to be in itself attractive. Lawns should be in large units, and all grounds should be grassed with durable turf. Walks and roads should be direct, ample in width, and serviceable in all weather. If placed where *needed*, they will obviate any "keep-off-the-grass" problem.

All buildings should be of fireproof construction, and of simple, dignified architecture. Bearing in mind that ample ground space is necessary, and that closely related units must be well articulated, it is desirable that buildings be grouped at one end or side of the campus rather than spread over the property. Buildings should be carefully oriented so that classrooms, kitchens, infirmary, gymnasium, toilets, and certain other rooms receive a maximum of natural light. Buildings in E, T, U, H or similar shapes insure the most adequate lighting. Courts should equal or exceed in width twice the height of enclosing wings. The best results are generally obtained when the abovementioned rooms, including also dormitories, are lighted from the southeast. East, southwest, west, and south are next in order of desirability. Art rooms, photography rooms, clinics, etc., are best lighted from the north.

The most-used units should be centrally located with relation to other units, while dormitories, faculty homes, heating and power plant, chapel, library, auditorium, infirmary, and gymnasium may need special locations. For instance, the auditorium should be convenient to transportation facilities and to the parking space provided for visitors, while the gymnasium should be convenient to the playing fields. Dormitories should occupy a quiet and more or less secluded site, as should the infirmary, while the chapel or library might well be given a position of prominence. Vista arrangements are often possible.

Covered connections between buildings are desirable.

A fence or wall about the property is optional, but is usually to be recommended if an adequate hedge would not suffice. Drinking and toilet facilities should be ample and convenient to all parts of the property.

A separate service drive should be planned to have access to dining, dormitory, storage, and power units. The visitors' driveway should accommodate one-way traffic. Sufficient parking space should be provided.

Adequate gymnasiums and playing fields should make it possible for more than one of the more common games and sports to be played simultaneously. Unless one or two teams are to be allowed to monopolize the fields, there should be two or three hockey fields, indoor baseball diamonds, basket-ball, volley-ball, and tennis courts. Winter sports should also be provided for where weather permits them during an appreciable portion of the school year. Field and track events should also have a place. Orientation of ball fields with regard to sunlight is important. Provisions for spectators should be considered in the original plans, whether actually built or not.

Since one important aspect of the country day school curriculum is its emphasis upon nature and outdoor life as essential elements in the health, academic and extra-curricular programs, the school should allow space for woods and fields, animals and birds, gardens and plants, and water and fish, if ample natural preserves are not immediately accessible. An outdoor theater is an asset.

In addition to the proper placing of the heat, light and power plant, the disposal of ashes, garbage and sewage should be carefully planned, and a fire-protective system should also be provided.

The Plant

The plant of the country day school, as of any other school or institution, is to be conceived in terms of (a) the services it is to house, and (b) the educational program it is to serve.

The services will necessarily be:

1. *Administrative Offices*
   a. Principal
   b. Assistant principal
   c. Secretary
   d. Bookkeeper
   e. Visitors' reception room
   f. Store and supply rooms
   g. Vault
   h. Telephone
   i. Post Office
   j. Dressing rooms and toilets
2. *Lower School*
   a. Classrooms
   b. Workrooms
   c. Play and assembly rooms
   d. Storerooms
   e. Wardrobes
   f. Toilets
3. *Upper School*
   a. Classrooms
   b. Recitation rooms
   c. Laboratories
   d. Shops
   e. Special subject rooms
   f. Study halls
   g. Storerooms
   h. Wardrobes
   i. Toilets
4. *Health and Physical Education*
   a. Director's office
   b. Examination room
   c. Nurse's office
   d. Emergency aid room
   e. Clinics
   f. Hospital and isolation rooms
   g. Gymnasium
   h. Swimming pool
   i. Dressing rooms
   j. Locker rooms
   k. Shower rooms
   l. Drying rooms
   m. Storerooms
   n. Toilets
5. *Dormitories*
   a. Students' rooms
   b. Teachers' rooms
   c. Salon
   d. Common room
   e. Music room
   f. Library
   g. Dressing rooms
   h. Telephones
   i. Office
   j. Toilets
6. *Dining Halls*
   a. Dining-room
   b. Cafeteria
   c. Kitchen
   d. Washroom
   e. Pantry
   f. Storeroom
   g. Refrigerator room
   h. Servants' dining room
   i. Wardrobes
   j. School toilets
   k. Servants' toilets
7. *Special Units*
   a. Auditorium
   b. Theater
   c. Chapel
   d. Library
   e. Museum
   f. Faculty home
8. *Services*
   a. Heat, light, power plants
   b. Maintenance and repair shop
   c. Janitorial
   d. Laundry
   e. Garage
   f. Farm
   g. Servants' living quarters

RIVERDALE COUNTRY SCHOOL FROM THE AIR

ROLAND PARK COMMUNITY SCHOOL, BALTIMORE, MD.
A wooded playground is reserved for small children

The number, sizes, location, articulation, equipment, design and cost of all these items vary enormously between schools. Some are overbuilt and some underbuilt, some poorly built and some lavishly built, and some have sacrificed well-paid teachers to good-looking buildings. The proper selection and determination of all these points are matters for the school to decide with great care, considering the school population, the educational program, and the financial program.

MANY PAGEANTS, PLAYS AND DANCES ARE BEST INTERPRETED IN AN OUTDOOR THEATER
The open-air theater in the Westtown School, Westtown, Pa.

In general, however, these things are true:

1. Buildings should be fireproof.
2. They should be constructed with an eye to the probable increase in enrollment.
3. They should be so planned as to allow for enlargement without destroying any part of previous construction.
4. Units to be built later should be planned and space provided for.
5. Buildings should be grouped at one end of the campus.
6. Classrooms and other rooms should be properly oriented for light and sun.
7. Buildings, rooms, and services should be properly articulated.
8. Architectural design should be consistent and dignified.
9. Cost should be as low as is consistent with adequacy, utility, safety and beauty.
10. Approach, landscaping, and service facilities are parts of the original plan.

Equipment

The equipment of the country school is usually more generous than that of the city school. This is particularly true as regards the equipment for health, play, and physical exercise; outdoor gardens, laboratories, and study activities; natural, physical, and household science; history, civics, geography—the social sciences; and the arts—painting, modeling, literary and craft. It differs little or not at all in the ordinary tool subjects, writing, spelling, reading, arithmetic, languages, etc.

Starting with the usual equipment of the conventional school, it is gradually added to according to class needs.

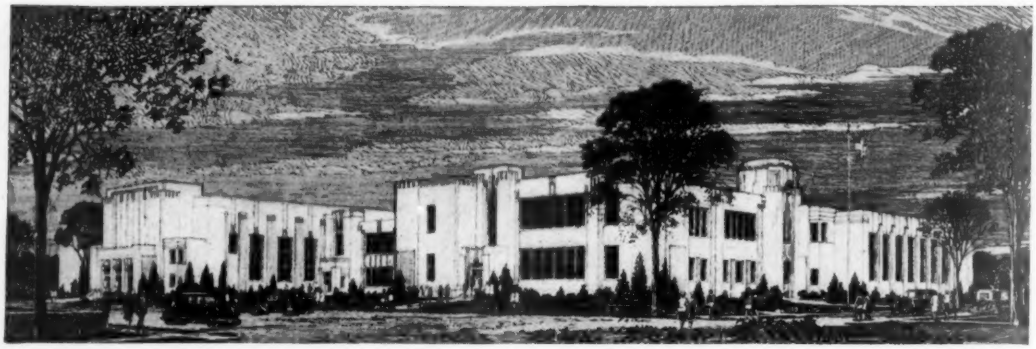
Conspicuous among the articles of equipment of the country day school are:

1. Very complete health and physical records and charts for each child
2. Complete accomplishment records of each pupil
3. Complete psychological and social records for each child
4. Health office and clinical equipment
5. Physical education director's office equipment for testing, measuring, and remedial exercises
6. Outdoor playground equipment
7. Garden equipment
8. Carpentering and building tools and equipment
9. Gardens, conservatories, and hothouses
10. Animal cages, aquaria, bird-feeding stations
11. Transportation facilities
12. Noon lunch facilities
13. Recess lunch facilities for little children
14. Model home for oldest girls
15. Motion picture machine, and projector
16. Play stores, villages, houses

Some of these articles of equipment are provided in the original plans for the schools, and some are provided when the need arises. Others are constructed in whole or in part by the children as a part of their school work.

THE FIELDSTON SCHOOL OF THE ETHICAL CULTURE SCHOOLS, NEW YORK CITY

This country day school is in Riverdale, a suburban residential development within the city limits



A School in the Modern Style —The Jefferson School, New Rochelle, N. Y.

BY E. A. VAN VLECK

STARRETT AND VAN VLECK, ARCHITECTS

WHEN the School Board of New Rochelle, N. Y., planned to replace their Thomas Jefferson Elementary School, they decided first that the name of the school should be retained, and second that the architectural treatment of the building should break with precedent. It seemed fitting that the second decision should follow the first, inasmuch as Jefferson was himself a man of many innovations, distinctly a modern in his age.

The architects were much pleased with these decisions, although they realized the difficulties facing them and the definite challenge to produce a fitting design with no historic formulae to aid in its development.

A Modern Design Expresses the Plan

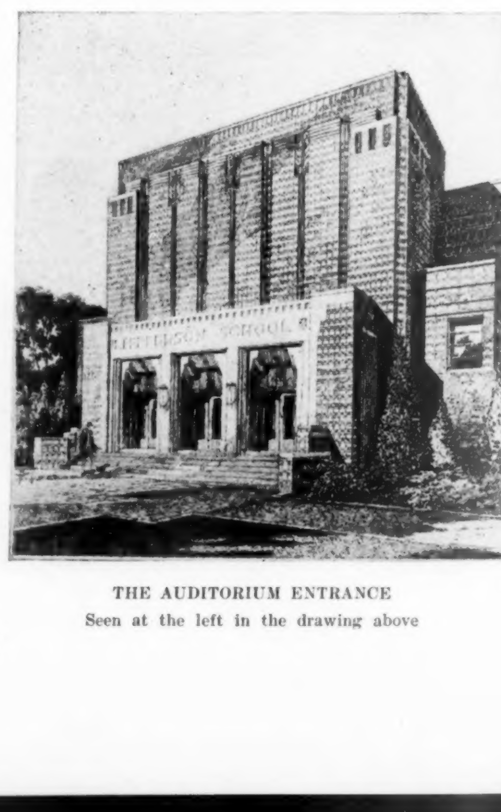
A modern design calls for a closer relationship between plan and elevations than is ordinarily the case. The design is therefore primarily functional, owing to lack of precedents. The expression of the plan in the outer structure becomes a matter of taste in design, and inasmuch as simplicity and efficiency are keynotes of the planning, these qualities are also fundamental in the elevation.

The Jefferson School, as it is now being constructed at a cost of approximately $560,000, is a grade school for 915 pupils, with the necessary classrooms and utilities (including provisions for the use of radio), a gymnasium, and an auditorium arranged for school and community use. Later on, a junior high school unit may be added to the left of the auditorium, with further expansion of each unit of the building as necessity may dictate.

Horizontality Characterizes the Building

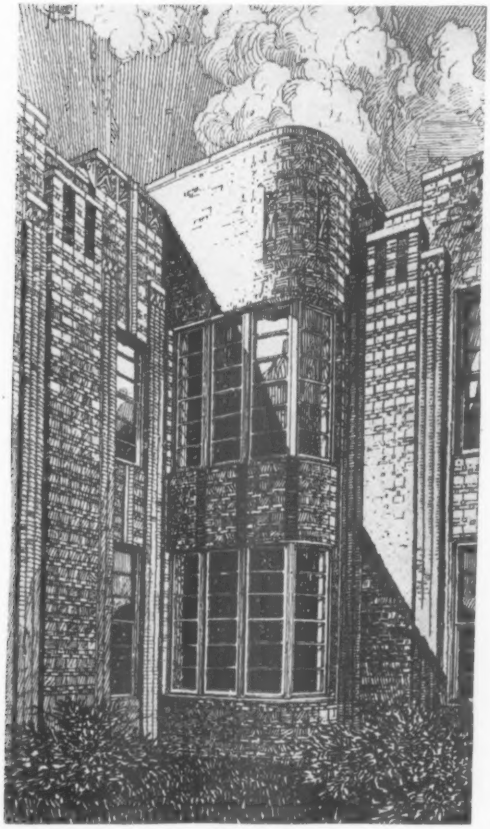
A distant impression of the building will be an undulating movement of colorful masses, which on closer approach detach themselves into the various units of the plan. The arrangement of the building is unmistakably shown in its exterior aspects. The dominating characteristic of the exterior is horizontality. A dwarf tower marking the main entrance is the highest feature; high windows to the right define the gymnasium; the grouped windows of the classrooms are emphasized with horizontal muntins without vertical lines. The auditorium as the central feature of the completed unit is treated in a simple manner to indicate its function.

An unusual characteristic is the apparent ab-



THE AUDITORIUM ENTRANCE

Seen at the left in the drawing above



AN ANGLE BAY

sence of dead-end classroom walls; it is felt that a designing liability has been turned into an asset through the opportunities afforded by the new style of architecture.

Details of the Exterior

A close approach to the building reveals the full color and texture-effects of the exterior, and the unusual architectural details. The building is emphatically of brick, entirely lacking in the customary stone trim. The brick itself has a rough wire-cut surface, and a color range of warm tones ranging from a yellow cast to a dark purple-red tone. The small amount of relief work and ornament is of special-shaped brick or of terra cotta matching the brick in color and texture. The walls are laid up in a new brick pattern indicated in the accompanying sketches, consisting of two courses of ordinary-size brick laid in Flemish bond, with an alternate course of over-size brick, 5 inches x 12¼ inches on the face.

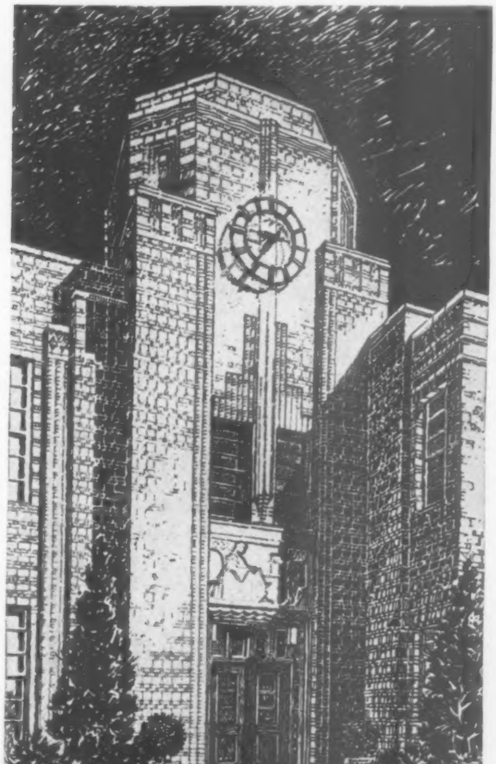
Windows in large units, with horizontal divisions only, are one of the outstanding features of the building.

The exterior relief work is distinctly architectural in character, and is cut back from a flush surface somewhat after the Egyptian manner. The main entrance is surmounted by a large panel 4 feet x 7 feet in size, allegorically depicting youth seeking wisdom.

Simplicity Also Prevails in the Interior

The modern treatment of the school is carried out in its interior in a straightforward way. The walls and ceilings of the main lobby are broken into simple planes. In the kindergarten the fireplace and door heads have modern touches. In the library the bookcases indicate in design and arrangement the prevailing spirit. The heads of the auditorium windows are carried directly to the flat ceiling, as is the stage opening, the latter flanked with conventional shafts, concealing cove lighting for the stage. A flush wood wainscot extends around the auditorium.

The treatment of the building throughout is as modern as its purpose, which is to provide pleasing and adequate quarters satisfying not only the special requirements of the school but also insurance ratings, the state school laws, and present-day educational standards.



THE STUDENTS' ENTRANCE

The Selection of Building Materials to Keep Down the Cost of Operation

This article has been contributed to The American School and University *by a school and church architect of wide experience who prefers to remain anonymous.*

THE subject of this article justifies a whole book, instead of the two pages to which the editor of The American School and University has asked me to restrict myself. Even in that limited space, however, I may be able to offer some practical suggestions, based on my own experience, which will be helpful to school and college officials.

My advice to a building committee concerned with the selection of materials is to first inspect other buildings of the type in which you are interested, and talk with those in charge of such buildings. When you find that a material has lasted a long time without causing trouble or complaint, under conditions similar to those with which you are confronted, then it is a safe material to use.

Use Is the Surest Test of a Material

I would rather take the advice of an experienced building superintendent or an intelligent janitor than that of many technical men I have met. The only technical men whose advice I am willing to follow are those who do not ride a hobby, who have no preconceived idea of how a material should work out, and who have a scientific turn of mind in the sense that they investigate the materials they propose to use. The results of experiments in the research laboratories of our universities, the Bureau of Standards and some of the larger school systems, where valuable work is being done testing the tensile strength of materials, their resistance to frost and heat, etc., are not yet sufficiently correlated with the question of architectural merit to make them of maximum assistance to the planners of buildings.

Although new adaptations of materials have been employed, no new material has been introduced in the building industry in the last twenty-five years. Building standards, however, have passed through various stages of evolution, from the elaborateness of the nineteenth century to the simplicity and efficiency which are required today. We are now trying to build our buildings with a saving of labor and yet with an architectural appearance commensurate with the amount of money we have to spend.

Factors to Be Considered

The factors to be considered in selecting building materials are, first, maximum durability; then, ease of upkeep and repair at a minimum of expense; next, initial and installation cost; and lastly, beauty and decorative value. My reason for placing beauty last is that beauty does not make materials; materials make for beauty. Beauty comes to the fore in any project that is based on truth and simplicity.

Moisture Affects Durability

Durability in brickwork means a brick which does not absorb water. If it does absorb water and the frost strikes it, it means the peeling-off of the brick, plus leaky walls and stains. For durable showerbath walls, for example, you should not use plaster finish. Strange as it may seem, it is done. The reason is that people think that if they paint plaster properly, it will throw off water. But the moisture does go through the plaster, the paint peels off, and the plaster is ruined.

Durability for Swimming Pools

In a swimming pool you cannot use a stamped steel ceiling, because the moisture will cut through the paint and the ceiling will rust. There is also a very good reason for the use of small ceramic tiles on the sides of swimming pools instead of large-size tiles (3 feet by 6 feet). Small tiles are applied to a soft bed of cement and are embedded all over in the cement so there are no voids behind the tiles. The joints are filled solid. Large-size tiles, on the other hand, are spread with a dab of mortar before being slapped against the wall. We know that that dab of mortar does not cover the large tile all over, so that when the sides of the pool are finished, multitudes of voids behind the tiles become filled with water. This makes the pool "weep." Water comes out from behind the tiles for hours after the pool has been emptied. That is one of the reasons why we have stopped the use of enamel brick for swimming pools; we have not succeeded in making the joints watertight.

The Weather Affects Certain Materials

You cannot use a veneered door on the outside of a building, no matter how well you paint it and protect it, because the moisture will loosen the glue. A sheet of galvanized iron or tin will last indefinitely, even though left in the weather, as long as it is untouched by shears or nails. But the minute it is fabricated and the edges are cut and exposed to the weather, we have a piece of rusted iron.

Use Determines the Type of Material to Be Used

In the selection of materials, therefore, we must consider suitability for dry or wet conditions, changes of temperature, and absorption of stains, as well as the giving-off of dust or objectionable odors. Durability, however, must be tempered with common sense. The most durable surface for a classroom wall, next to tile, is a cement wall. You can throw hard instruments against it and not damage it. But therein comes the question of utility: the surface is hard, and reflects the sound waves without absorbing them. That makes for a noisy room. Wood and then plaster are probably the best sound-absorbing materials outside of felts and porous materials. You will never find a marble surface in an auditorium that has good acoustics. On the other hand, if you have a storeroom where chairs or gymnasium apparatus are kept, the walls should be covered with a hard cement all the way through to the foundations; a skin coat of cement on top of soft plaster does not last.

Cement Floors

A cement floor that has been improperly laid will stay rough until it is all worn down. You cannot increase the durability of a cement floor that has not had the proper binder before it is set; putting steel filings on the top will not help. That is like wearing hobnails on your shoes; it means they last longer, but the hobnails do not stiffen the leather or make it harder. You can also paint a cement floor, but the paint soon wears off and then the floor has to be repainted. That is expensive, and the room is out of use while it is being done over.

Waxing Wooden Floors

The reasons that waxed wooden floors are preferable are that you do not have to wait for wax to dry; it is a simple process to apply it; and the old and new wax blend together. Wooden floors may be varnished, but the varnish wears off where the floor is used most, and remains in the corners and under the furniture. If the floor is revarnished, the worn surfaces are a different color, so the whole surface must be taken off and a new start made.

The Proper Care of Materials Is Important

I know of many instances where waxed or oiled floors, such as in a gymnasium, are mopped daily with a water mop containing soda or cleaning compounds. The ignorance concerning building materials is remarkable. People do not seem to realize that alcohol removes varnish and shellac, and that it softens paint. They do not realize that if they oil a brass surface after it has been polished, it will remain polished three times as long as otherwise. They do not realize that if they wash the tile in a swimming pool or shower with an acid, it will eat out the cement joints; that if they use an acid on marble, it takes off the polish. They are not aware that veneers become loose in rooms that have no moisture, or that excessive dampness swells wood. They do not know that steel or iron pipe embedded in concrete that contains soft coal ashes will be eaten away. They do not know that unless wood beams or wood floors have an under-air current they develop dry rot.

Paint Is Often Mistreated

I have often seen a janitor wash down a painted wall with washing soda. I remember one janitor's telling me that he could always tell when to stop washing—when the water in his pail became milky white.

If you paint with lead and oil paint on top of a greasy surface, the paint will not dry. If you put a layer of paint on top of another layer of paint when the first layer has not had time to dry, the paint will crack. If you paint on top of wet plaster, the moisture will separate the paint from the plaster. You cannot paint on top of cement and expect the paint to hold back water. You do not have to paint cast iron, because it does not rust enough to do any harm, but you do have to paint steel and keep repainting it, because steel has a constant tendency to revert to its original form. If you want to eliminate the cost of repainting, you must use in the first place a material that does not rust.

Good Materials Pay

A piece of steel, costing half the price of a piece of non-rusting metal, soon costs more than the non-rusting metal when you have to paint the steel a number of times during the life of a building. The life of an institutional building such as a school is about thirty years, more or less. So in selecting materials we must ask, "Will this material last thirty years without replacement?" Very few inferior materials cost less, after being replaced twice, than the cost of installing better materials in the first place. Replacement or repair means not only money for labor and materials, but also the dislocation of the program of the building in question.

Therefore I reiterate: In selecting building materials, never be carried away by enthusiasm because of color or shape. Use only materials that you can see have lasted well under conditions similar to those confronting you.

Special-Room Facilities in Superior Consolidated School Buildings

BY JULIAN E. BUTTERWORTH

DIRECTOR, GRADUATE SCHOOL OF EDUCATION, CORNELL UNIVERSITY

IN recent years the schools in the rural areas of the United States (those in places of less than 2,500 population) have been making considerable progress in lengthening the school term, in improving the training of teachers, the salaries paid, the equipment provided, and the like—factors essential to the development of a good school. In many of the schools in a few states, and doubtless in some schools in all states, much is still to be desired. Yet the fact that school conditions throughout the country are improving cannot be denied.

Facilities in Rural Schools Inferior to Those in Cities

It does not appear, however, either from general observation or from a study of such data as are available, that our rural schools are providing to any noticeable extent those newer facilities that are finding their way into the progressive school systems of the cities. These facilities include provisions for kindergartens, auditoriums, gymnasiums, lunch rooms, special rooms for vocational education, for health education, and the like. The one-room and other small schools of the open country cannot, of course, offer much beyond the fundamentals. The early consolidated schools offered some special facilities, but usually of a meager sort as measured by present-day standards.

Investigation of Facilities in Superior Consolidated Schools

What special-room facilities are our better rural schools now providing? An investigation to answer this question was undertaken by the writer in the fall of 1930, and is reported in this article. No attempt has been made to give a true picture of conditions in general; the schools studied are frankly of a superior type. The purpose of the investigation was to show what these better schools are coming to regard as essential in a program for rural boys and girls. The facilities provided by such schools suggest an attainable goal toward which other communities may work.

Requests for data were sent to fifteen consolidated schools in each of the following eight states: Alabama, Iowa, Indiana, Kentucky, Michigan, New York, Ohio and South Carolina. The schools were suggested by the various state departments as having the best buildings from the point of view of the special facilities mentioned above. Replies were received from 77 of the 120 schools. These came from the various states as

AUDITORIUM-ASSEMBLY ROOM IN THE CONSOLIDATED SCHOOL AT NEW PARIS, IND.

THE KINDERGARTEN IN THE WATERVILLE, N. Y., CENTRAL SCHOOL

follows: Alabama, 7; Indiana, 11; Iowa, 15; Kentucky, 9; Michigan, 13; New York, 9; Ohio, 8; and South Carolina, 5.

The Relation Between Size and the Provision of Special Facilities

Since this article is not concerned with comparisons of the facilities offered by superior consolidated schools in the different states, the data have not been grouped on that basis. It is interesting, however, to see what effect, if any, a school's size has upon the room facilities provided. Hence the schools have been classified into four groups according to the number of teachers employed:

TABLE 1

Groups	Number of Schools
Not more than 10 teachers	14
11–20 "	48
21–30 "	13
31+ "	2
Total	77

While the number of schools in most of the groups is not large enough to justify a generalization concerning the relationship between the size of the school and the facilities provided, the data do suggest certain tendencies. Attention should be directed chiefly to the data regarding all schools. Fourteen of these buildings were erected prior to 1921; 26, between 1921 and 1925; 37, since 1925.

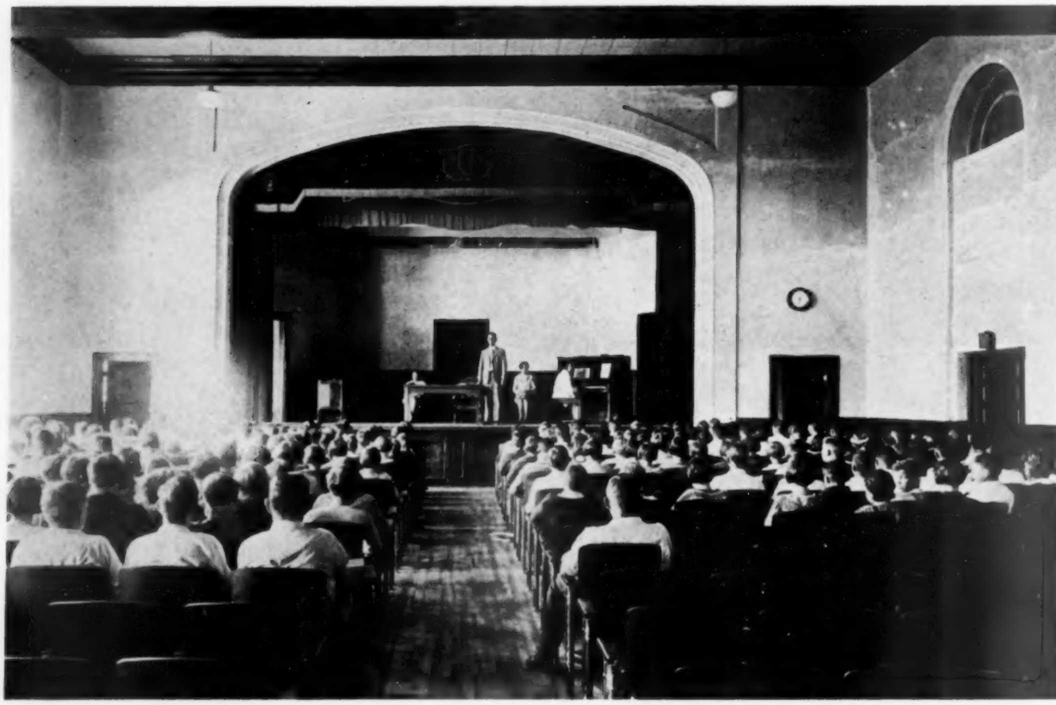
Kindergartens

Only one-fifth of the 77 schools have a special kindergarten room. This small percentage for superior consolidated schools makes one realize that this particular activity in the modern school program is not likely to be available to a very large percentage of the children living in the rural areas.

TABLE 2

Size of School	Number of Schools Having a Kindergarten Room	Per Cent of the Number of Schools, by Groups [See Table 1]
Not more than 10 teachers	4	28.6
11–20 "	6	12.5
21–30 "	5	38.5
31 "	1	50.0
Total	16	20.8

While this investigation did not undertake to evaluate the *quality* of the facilities provided, it may be well to note that in 7 of the 16 schools the kindergarten room approaches in size the customary standard of 1½ classrooms (about 22 x 45 feet). While a smaller room may be justified in those communities where the kindergarten attendance is very small, a scrutiny of the data regarding attendance in the elementary school (as an indication of the probable at-

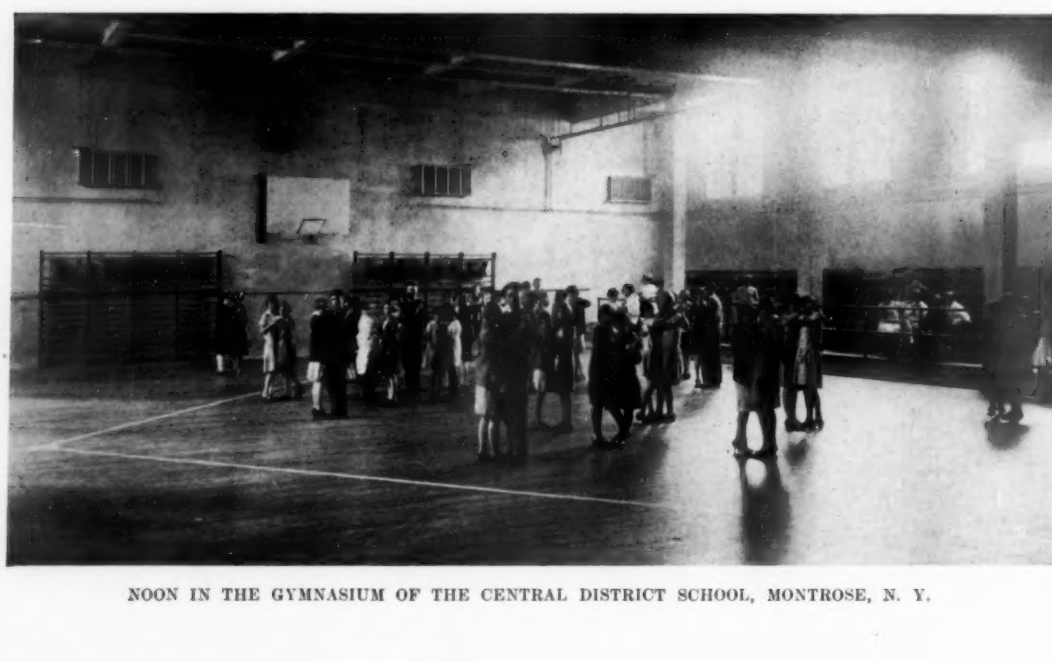


THE ASSEMBLY ROOM IN THE TALLAHASSEE HIGH SCHOOL, TALLAHASSEE, ALA.

tendance in the kindergarten) shows practically no relationship between attendance and size of room.

Auditoriums and Gymnasiums

Much better provisions were found to have been made for auditoriums and gymnasiums. Of the 77 schools, only one lacks auditorium facilities, and only eight lack gymnasium facilities. About one-third of all the schools have a combined auditorium and gymnasium. According to the data assembled, all schools with a separate gymnasium have at least one dressing-room, while most schools have two or more, ranging



NOON IN THE GYMNASIUM OF THE CENTRAL DISTRICT SCHOOL, MONTROSE, N. Y.

in size from mere "cubbyholes" (e.g., 7 x 12, 8 x 12) to what would usually be considered commodious quarters for such purposes (e.g., 20 x 35; 20 x 20; 20 x 30). In most cases the dressing-room contains from 300 to 400 square feet of floor space.

TABLE 3

Size of School	Schools Having an Auditorium No.	Schools Having an Auditorium Per Cent	Schools Having a Gymnasium No.	Schools Having a Gymnasium Per Cent	Schools Having a Combined Auditorium and Gymnasium No.	Schools Having a Combined Auditorium and Gymnasium Per Cent
Not more than 10 teachers..	9	64.4	8	57.1	4	28.5
11–20 " ..	30	62.5	28	58.3	17	35.4
21–30 " ..	9	69.2	5	38.5	5	38.5
31 " ..	1	50.0	1	50.0	1	50.0
Total	49	63.6	42	54.5	27	35.1

Other Rooms for Health Education

The room facilities for a health education program are, outside the gymnasium, disappointingly meager. None of the 77 schools has an open-air room or suite. Only one has a separate dentist's room, although four report the use of the nurse's or physician's office for this purpose. Only 18, or 23 per cent, have a nurse's or physician's office. Of these 18 offices, 3 are found in the 14 schools with not more than 10 teachers; 9, in the 48 schools with 11 to 20 teachers; 4, in the 13 schools with 21 to 30 teachers; while both the schools with over 30 teachers have such a room.

Vocational Rooms

The data indicate that rooms for vocational work are much more prevalent than are those for a modern health program. Almost nine-tenths of the schools have facilities for home-making classes, while nearly four-fifths have agricultural rooms. About one-half have rooms for a commercial curriculum, and about two-thirds have wood-working rooms. Separate machine shops are found in only four schools, or in about 5 per cent of the total number, although in seven cases the wood-working room and the machine shop are combined. The latter cases are found largely in the smaller schools, comprising the first two groups. Printing equipment is available in three schools, and in a few isolated instances rooms are provided for normal training, for drafting, and for printing.

TABLE 4

Percentage of All Schools Having Rooms for:

Size o. School	Agriculture	Home-Making	Commercial Work	Wood-Working	Machine Shop	Printing	Other Vocational Purposes
Not more than 10 teachers	71.4	71.4	14.4	50.0	0	7.1	0
11–20 "	81.3	91.6	56.3	66.6	6.3	4.2	6.3
21–30 "	76.9	100.0	76.9	76.9	7.6	0	0
31 "	50.0	100.0	50.0	100.0	0	0	0
Total ..	77.9	89.6	51.9	66.2	5.2	3.0	3.9

The Vocational Emphasis Is Shifting

The foregoing data suggest a problem regarding the vocational training of boys and girls in the rural areas that is extremely significant. In the past, emphasis has been given to agriculture and home-making. Naturally, many rural boys, especially those from farms, will enter farming occupations; and most girls will become home-

SHEET METAL SHOP IN THE TALLAHASSEE HIGH SCHOOL

THE AUTOMOTIVE SHOP IN THE WATERVILLE CENTRAL SCHOOL

makers. Yet many boys will and should enter other fields of work, since it is evident that we already have fully as many farmers as the country needs. It is therefore stimulating to find that about half the schools in this study have facilities for teaching commercial subjects, and at least a scattering of them offer other opportunities for vocational training. It must be remembered, however, that, since these are superior schools from the point of view of the special rooms provided, the situation in our rural areas as a whole is certainly not so favorable.

The need for more extended vocational training is one of the outstanding needs in rural education today. Since it is evident that the typical consolidated or village school has neither the wealth nor the pupils to justify an extensive vocational offering, other units of school control must be utilized. County or regional vocational schools may be the solution in some situations, while contracting with a nearby city may be the best procedure in other situations.

Administration Rooms

Some facilities must be offered, even in small schools, for housing administrative activities, if these are to be carried on economically and effectively. While it may well be questioned whether a separate board room in a smaller school is an economical use of available space, over 15 per cent of the 77 schools have such a room. Practically all have a principal's or superintendent's office, but only about 12 per cent have a separate clerk's office. Two-thirds have a separate general supply room.

TABLE 5

	Percentage of All Schools Having:				
Size of School	Principal's or Superintendent's Office	Separate Board Room	Separate Clerk's Office	General Supply Room	Other Rooms for Administration Purposes
Not more than 10 teachers	85.7	0	14.3	55.7	0
11–20 "	100.0	14.5	10.4	64.6	4.2
21–30 "	100.0	23.1	7.7	77.7	0
31 "	100.0	100.0	50.0	100.0	50.0
Total ...	94.8	15.6	11.9	66.2	3.9

Rooms for Teachers

Almost two-thirds of the schools have a separate teachers' room. Nine have two teachers' rooms, one for men and one for women. Several schools use other rooms, such as the library or the nurse's room, for teachers' rooms. It is difficult to see, however, how either of these latter rooms may be effectively used by the teachers without interfering with the service which the rooms should render to pupils. While it may well be that a room of this type should, in communities where building costs must be kept to a minimum, give way to other types, it should nevertheless be recognized that a room where teachers may leave their personal belongings, where they may relax during the noon hour or when school duties do not demand their presence


THE TEACHERAGE AND SUPERINTENDENT'S COTTAGE, AT THE LEFT, AND THE BUS GARAGE, AT THE RIGHT, OF THE LOHRVILLE, IOWA, CONSOLIDATED SCHOOL

The ten busses owned by the district are stored in the garage, which has a well-equipped repair shop where a full-time mechanic makes all repairs

elsewhere, and where they may converse freely among themselves, is much to be desired.

Libraries

Over 90 per cent of the schools in this study have a separate room for a library. Such a separate room may be an advantage or a disadvantage, depending upon its administration. Usually a small school cannot afford a special librarian and cannot even release the various teachers sufficiently to provide a teacher-attendant for each period of the school day. In such cases the library will probably best be put in the study hall.

It is of interest, however, to note the very large proportion of schools that have a separate library room; it at least suggests that the library was more than an incidental thought when the building was constructed. Of these library rooms, about 20 per cent are of approximately classroom size (about 22 x 30 feet); another 20 per cent are considerably over classroom size; about 40 per cent are approximately one-half classroom size; and the remaining 20 per cent are considerably less than one-half classroom size. (See Table 6.)

The solution for the problem of securing specialized library service for a number of our consolidated and village schools may be to have a combined school and community library. While there are certain disadvantages in such a plan, they are, in the judgment of the writer, not of sufficient importance to justify the continuance of the dual system without adequate facilities in either the school or the community library.

THE CAFETERIA IN THE CONSOLIDATED SCHOOL AT CROTON-ON-HUDSON, N. Y.

TABLE 6

Size of School	Library Room	Lunch Room	Music Room	Other Special Rooms
	Percentage of Schools Having Special Provisions for:			
Not more than 10 teachers....	92.8	21.3	50.0	0
11-20 "	89.5	62.5	66.6	10.4
21-30 "	92.3	61.5	69.2	23.1
31 "	100.0	100.0	100.0	0
Total	90.9	55.8	64.9	10.4

Lunch Rooms and Music Rooms

A little more than one-half of the 77 schools have a separate lunch room, several having cafeterias in connection. Somewhat tardily we are coming to recognize the importance of an attractive room where children away from home may eat their noon meal.

About two-thirds of the schools have a separate music room. In several other cases the auditorium is used for this purpose.

The Significance of the Data

These figures represent superior consolidated school buildings in eight states. They should be considered, therefore, as giving some indication of the special-room facilities offered in our better consolidated districts; they cannot, of course, be considered as representative of all such districts.

In order to make the special facilities discussed in this article available to all rural school pupils, certain reforms are imperative. Local units, larger even than many of our present consolidated districts, must be developed so that the size of the pupil-group may be sufficient to justify more elaborate space provisions. The states must develop equalization funds on a wider scale so that these desirable special-room facilities may be included in all rural schools without imposing an unreasonable burden upon any one locality.

A High School and Junior College for Negroes

The Paul Laurence Dunbar High School, Little Rock, Ark.

BY C. R. HAMILTON

SUPERVISOR OF NEGRO SCHOOLS, LITTLE ROCK, ARK.

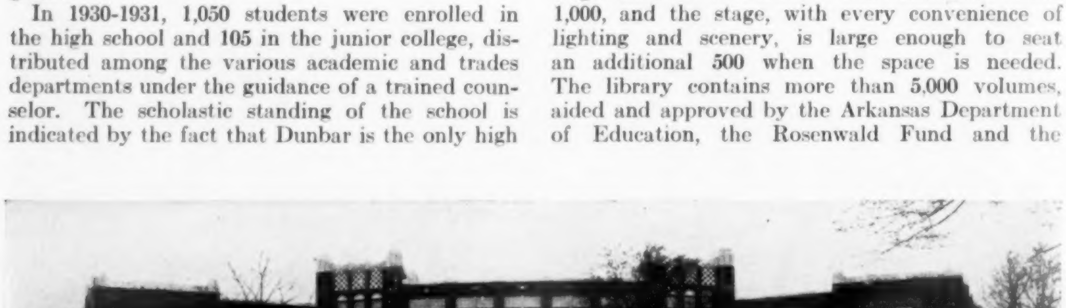
WITH the opening of the Dunbar High School and Junior College in April, 1930, Little Rock, Ark., sprang into the enviable position of First City of the South so far as the completeness and magnificence of its Negro high school structure is concerned. R. C. Hall, Superintendent of Schools, and the Board of Education have established themselves among the few forward-looking and generous school boards of the nation which provide junior college education for Negroes.

In 1930-1931, 1,050 students were enrolled in the high school and 105 in the junior college, distributed among the various academic and trades departments under the guidance of a trained counselor. The scholastic standing of the school is indicated by the fact that Dunbar is the only high school in the South to be accredited by the North Central Association.

The building cost $425,000, of which $67,000 was contributed by the Rosenwald Fund and $30,000 by the General Education Board. The local school board appropriated approximately $325,000.

Facilities and Equipment Are Up-to-Date

The facilities and equipment in the Dunbar High School are modern. The auditorium seats 1,000, and the stage, with every convenience of lighting and scenery, is large enough to seat an additional 500 when the space is needed. The library contains more than 5,000 volumes, aided and approved by the Arkansas Department of Education, the Rosenwald Fund and the



THE PAUL LAURENCE DUNBAR HIGH SCHOOL, LITTLE ROCK, ARK.

THE SCIENCE LABORATORY

combined Negro Parent-Teacher Associations of Little Rock. Sixteen hundred individual recessed steel lockers are available for the pupils, and there is a well-equipped cafeteria with a capacity of 510.

The Emphasis Is Upon Vocational Work

Vocational work for boys and girls is being stressed this year. The policy of the vocational department, according to J. H. Moreau, Supervisor, is to give every boy and girl in the school an opportunity to take up the type of work he or she is most capable of doing, in order that each may be trained to become a self-supporting citizen.

To this end, A. B. Fox, a teacher connected with the school for years, was sent to Harvard for a special course in vocational guidance and counseling. His work this year has been to hold personal interviews with all pupils in the school, in an effort to discover the vocations for which they are best fitted. It is his duty to investigate economic conditions and the possibilities of various lines of work and then to make recommendations that will become effective in wise choices on the part of the pupils.

THE AUTO MECHANICS SHOP

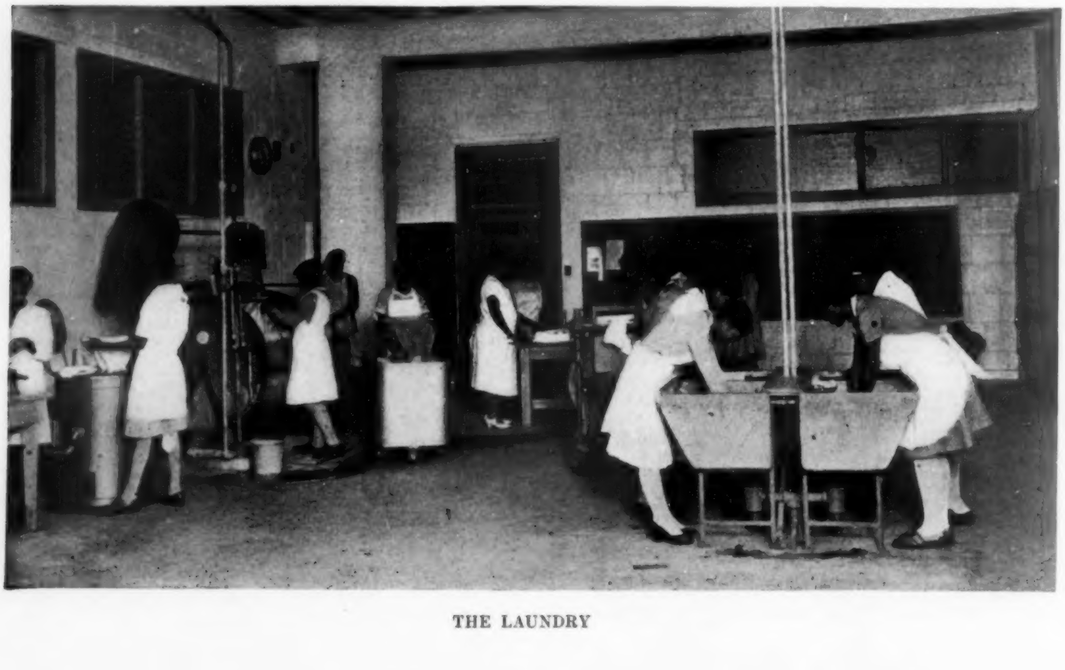
THE SEWING ROOM

Varied Types of Instruction Are Offered

The trade courses offered at Dunbar at present include carpentry, bricklaying, plastering, cement work, and auto mechanics, both repair and servicing. Other classes in trade work will be started if there is sufficient demand or justification.

For girls, trade work is offered in laundering, sewing, cooking, and nursemaid training. These trade courses all take from one to two years.

The instructors for the trades work have been selected with great care in order to employ only those who have both teaching and technical training, which enables them not only to do the work of their respective trades but to teach it to the students in such way as to add dignity to the



THE LAUNDRY

TWO VIEWS OF THE CAFETERIA IN THE DUNBAR HIGH SCHOOL

vocation and to inspire the students with a zeal for their work.

Course Enrolments for the Present Year

This year 29 boys have been studying auto mechanics; 15, carpentry; and 15, bricklaying. Twenty girls have been taking up sewing; 60, laundering; 60, cooking; and 60, nursemaid training. A number of pre-vocational or try-out courses include woodwork and drawing; electric wiring and plumbing; bricklaying and plastering; and auto mechanics.

One course is required of every boy who enters Dunbar, the home mechanics course. This consists of unspecialized activities, things that need to be done around the average home, such as electrical work, plumbing, repairing woodwork, sheet metal, auto repair, and a few miscellaneous jobs like sharpening the lawn mower and repairing the garden hose.

Objectives of the School

The school endeavors to send each girl and boy away with something gained, either in the academic or in the vocational departments, or in both.

With this splendid building, which combines beauty, utility, durability and safety, Little Rock has set a pace for other cities to follow in building high schools in which every young person may be properly trained to earn an honest and comfortable living, and to live wisely on what he does earn. Artcraft, science, literature, history, mathematics and sociology are so blended and correlated as to develop students into efficient, useful and happy citizens.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Acoustical Treatment—The Celotex Co.
Auditorium Seating—Heywood, Wakefield Co.
Blackboards—Pennsylvania Structural Slate Co.
Boilers—Kewanee Boiler Corp.
Cafeteria Equipment—E. H. Sheldon & Co.
Clocks and Fire-Alarm Signal Systems—International Time Recording Co.
Doors—Wheeler, Osgood Co.
Drinking Fountains, Plumbing Fixtures, Sanitary Equipment, and Showers—N. O. Nelson Co.
Heat Regulating System—Johnson Thermostatic Control Co.
Laboratory Furniture and Equipment—Kewaunee Mfg. Co.; W. M. Welch Mfg. Co.
Lockers—Lyon Metal Products, Inc.
Stage Equipment—Okla. City Scenic Co.
Windows and Sash—Detroit Steel Products Co.

THE SHERMAN SCHOOL, WATERTOWN, N. Y.

Where Utility and Beauty Go Hand in Hand

BY RAYMOND C. BURDICK

SUPERINTENDENT OF SCHOOLS, WATERTOWN, N. Y.

and

ADA R. MADDEN

GRADE SUPERVISOR

SHERMAN SCHOOL, Watertown's newest elementary school, demonstrates the fact that a school can have simple, dignified and modern utilitarian arrangement and equipment and at the same time represent a cost low enough to remove it from the classification of those buildings heralded as evidences of "how the taxpayers were robbed." The building houses classes from kindergarten through grade six. It cost $182,-748.36, or 37.7¢ per cubic foot.

Built one block from Washington Street, perhaps the most beautiful street in northern New York, Sherman School has for its setting approximately five acres of grounds. At the rear and to the left, these grounds adjoin a new section of the city which is as yet open country. To the front and to the right, new streets are being laid. Large elms and maples afford the shade that reminds us of New England settings. At the rear will be a spacious playground, partly shaded, partly cleared. At the right is a circular drive and a parking space large enough to accommodate 75 cars. The lawn in front is unbroken except for the wide semi-circular walk which leads to three entrances, each of which has its own dignified doorway, its lights, and its touch of Gothic ornamentation.

The building itself is of tapestry brick in which a clear blue reveals itself slightly more than in most bricks of this type. The trimmings of tinted litholite blend pleasingly with the brick walls.

Beginning with the basement, the idea of utility is evident in every detail. A bicycle runway near stairs leading directly to the first floor makes it possible for riders to park their bicycles in the racks and proceed at once to the classrooms above. The boiler-room occupies the major portion of the basement. In this is a lavatory, fire-alarm box, telephone and clock. The distance from the boilers to the coal-bin is a matter of a few feet only. These bins are directly in front of the boilers, thus making the path a straight one. Four outside entrances make the filling of the coal-bins and the delivery of all supplies easy and rapid, as it is possible to drive a truck up to the door of all basement entrances except the one opening into the bicycle room.

A large stockroom for janitor's supplies is situated next to the boiler-room. There are also the boys' showers and lockers, with lavatory and toilet, and a kitchen for the use of the Parent-Teacher Association and for children and teachers who may remain through the noon hour. The power-room is entirely separate and well protected from intruders. All floors in the basement were treated with waterproof dressing before the cement finish was laid.

Outside the building at the right, a terraced entrance with a wide cement platform leads directly into the first floor corridor, where one sees first the ticket booth for the auditorium-gymnasium. Above this booth is the fireproof compartment, ready for the installation of a sound picture machine. The stage in this auditorium is equipped with footlights and border lights. Cyclorama and borders of rep in a neutral gray, together with three practical doors to be used as stage entrances, afford opportunity for diversified stage settings. At the front is the green velour curtain with its "S" for Sherman. Wiring at the rear of the stage makes radio installation possible. Gymnasium equipment will be placed

THE AUDITORIUM-GYMNASIUM

with a view to keeping a balance on the varied uses of the room. The outside entrance and exit make it possible to use this room without disturbing any other part of the building.

The principal's inner and outer office are at the right of the center front. These are equipped with master clock, switchboard, lavatory room, files and cupboard. The clinic room, directly across from the principal's office, has its own lockers, lavatory and cupboard space. This room will be furnished with all equipment necessary to carry on the work of the school doctor, nurses, dentist, and oral hygienists.

THE KINDERGARTEN

The teachers' rest room, with its comfortable furniture, opens directly into the library. This library, facing the front of the building, has both

THE LIBRARY

open and closed shelves, magazine rack, large filing cabinet, librarian's desk, tables, and chairs.

The kindergarten room, also at the front of the building, has its own entrance from the street, as well as another entrance from the center corridor. In a small room adjoining the cloakroom is a lavatory and toilet for the use of kindergarten children exclusively. Large cupboards with frosted glass doors provide room for material. In the center of one side is the fireplace with a plain but good-looking mantel.

Six regular classrooms on the first floor and nine on the second provide space for fifteen classes. Each of the rooms has well-placed blackboards on two sides, cork bulletin boards, and enclosed cupboards. A coaching room on the first floor is also provided with a generous amount of blackboard space and other visual aids. All primary classrooms are equipped with movable furniture. The cloakrooms in connection with each classroom have two lights, thus providing adequate illumination on even the darkest day. There are two stockrooms on each floor, also toilets. The showers for the girls, with accompanying lavatories and dressing-rooms, are on the first floor.

A complete telephone system providing buzzers in all classrooms, with extensions for conversation centrally placed in the corridors, is operated from a switchboard in the principal's office. Exit lights for emergencies are placed in the ends of all corridors. Reinforced floors are used throughout the building. The heating system is the unit plan with hand control in each classroom. In every detail an endeavor has been made to make this building a fireproof structure. Stairs with a wide tread and a low lift add to the safety and comfort of both teachers and children. An environment which so clearly bespeaks beauty and utility must surely inspire all who come within it.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Auditorium Seating—Readsboro Chair Co.
Blackboards—Keenan Structural Slate Co.
Classroom Furniture—American Seating Co.
Clocks, Signal Systems, Fire Alarms, and Interior Telephone Equipment—The Standard Electric Time Co.
Doors—Morgan Sash and Door Co.
Drinking Fountains, Plumbing Fixtures, and Sanitary Equipment and Showers—Crane Co.
Heating and Ventilating System—B. F. Sturtevant Co.
Library and Office Equipment—Remington-Rand Business Service, Inc.
Lighting Globes and Fixtures—General Electric Co.
Lockers—Durabilt Steel Locker Co.
Partitions (Shower)—The Sanymetal Products Co.
Roofing and Insulation—Johns-Manville Corp.
Stage Equipment—Universal Scenic Studio
Window Shades—Interstate Shade Cloth Co.

Planned Lighting for Educational Buildings

BY D. H. TUCK
ELECTRICAL ENGINEER, HOLOPHANE COMPANY, INC.

IT is well known that eyesight is the most essential of the five senses for the assimilation of learning. Without good illumination the eye functions at a disadvantage, and mental development is retarded. Ophthalmologists know that the physiological condition of the eye depends to a great degree on its use and abuse, and they realize that insufficient illumination or glare not only impairs pupils' vision but leads to faulty habits of posture that affect their health in later years.

Good illumination is absolutely necessary for the fullest attainment of the fundamental purposes of education. Even in modern schools, daylight cannot be relied upon to give adequate illumination at all times of the day or at all locations in the schoolroom. Continuation school work, for instance, is usually carried on at night. If the investment in schools is to be efficiently made, school buildings must be equipped with an adequate system of artificial lighting so that all parts of the building can be utilized at all hours in the most effective manner.

Knowledge of the physiology of the eye and of the theoretical and applied science of illumination is sufficiently advanced so that the following definite rules can be given for efficient and economical school illumination from the standpoints of (a) maximum rapidity of learning, and (b) eye and health conservation.

Rules for Efficient School Illumination

1. **Required Intensity.**—The intensity of illumination in foot-candles measured on a horizontal surface for any given room should be not less than 10 divided by the reflection factor (expressed as a decimal) of the object worked upon. (Exceptions to this rule are storage space, corridors and other non-working spaces.)

2. **Prevention of Glare.**—The reflector equipment should not allow more than 20 per cent of the bare lamp flux to be emitted in the 60-90 degree zone measured from the nadir.

3. **Color of Light.**—The color of the light should not be materially different from that of the bare incandescent lamp.

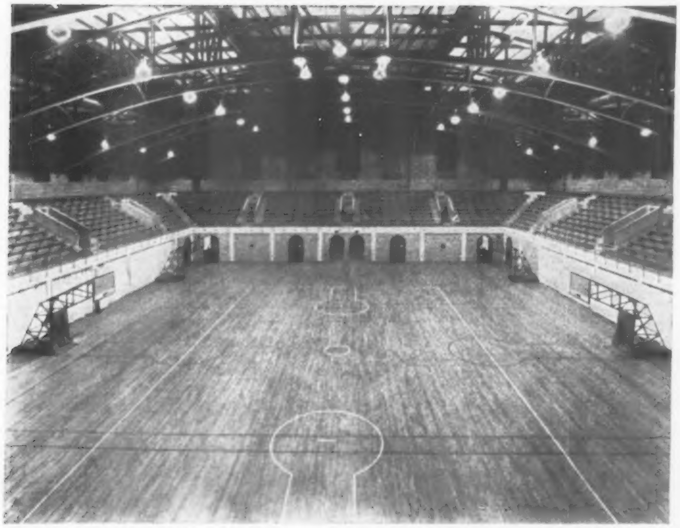
4. **Efficiency.**—(a) *Direct Lighting*—The output of the reflector should not be less than 40 per cent of the bare lamp flux in the 0-60 degree zone measured from the nadir, and not less than 20 per cent in the 90-180 degree zone. (b) *Semi-Indirect Lighting*—The output of the lighting unit should not be less than 55 per cent of the bare lamp flux in the 90-180 degree zone measured from the nadir, and not more than 15 per cent in the 0-60 degree zone.

5. **Depreciation.**—The luminaire should give not less than 85 per cent of its initial output after 120 days actual depreciation as a result of dust accumulations on the luminaire. There should be no permanent depreciation of the reflecting, refracting or diffusing surfaces.

6. **Fixtures.**—Lighting fixtures are only necessary accessories to the incandescent lamp. They should be considered as such and not as decorations. Just as the type of work and study varies in different departments of the school, so also should the lighting. The fixtures in the various school departments should be selected for their specific application.

SEMI-INDIRECT LIGHTING IS RECOMMENDED FOR CLASSROOMS

SOFT, WELL-DIFFUSED ILLUMINATION OF HIGH INTENSITY IS REQUIRED IN LIBRARIES, READING AND STUDY ROOMS



THE LIGHTING IN THE RECREATION HALL OF PENNSYLVANIA STATE COLLEGE, STATE COLLEGE, PA., HAS BEEN CAREFULLY PLANNED TO BE ADEQUATE FOR BASKET-BALL, BOXING AND WRESTLING

THE DISSECTING ROOM OF THE LABORATORY OF ANATOMY, TEMPLE UNIVERSITY MEDICAL SCHOOL, PHILADELPHIA, PA.

Direct lighting units of color-correcting glass are used to provide high intensity of illumination on the working areas, at the same time permitting careful color discrimination

THE ACADEMY BUILDING, DEERFIELD ACADEMY, DEERFIELD, MASS.
This building was made possible by a $1,000,000 fund recently raised by the school for new construction and endowment

Private School Expansion and Recent Architectural Trends

BY PORTER SARGENT
EDUCATIONAL ADVISER, BOSTON, MASS.

NEVER before has so much money been available for new private school construction, and never have so many of the leading architects of the country been giving their best to the designing of buildings for private schools.

Recent Large Gifts to Private Schools

This architectural activity has been greatly stimulated by the increasing flow of large gifts to private schools. Notable among these are the **$17,000,000** endowment of the Kamehameha Schools in Honolulu by the estate of Bernice Pauahi Bishop; the **$15,000,000** Cranbrook Foundation of Mr. and Mrs. George G. Booth, of Detroit; the Harkness gift of more than **$7,000,000** to Phillips Exeter Academy, Exeter, N. H., for buildings and endowment; the millions that Thomas Cochran and others have lavished upon Phillips Academy, Andover, Mass.; the **$7,000,000** that Mrs. Theodate Pope Riddle has given to Avon Old Farms, Avon, Conn.; and the **$6,000,000** given by Mrs. Henry Ford to the Berry Schools, near Rome, Ga. Dwarfing all these would be the **$100,000,000** which it is rumored Henry Ford plans to spend annually on education.

Extensive Building in Recent Years

A survey published in *Private School News* for February, March, and May, 1931, revealed that approximately **$240,000,000** was available or had been spent within the last two years for private school construction or endowment. An architects' exhibit of plans and designs for private school buildings, on view at 11 Beacon Street, Boston, since last December, shows evidence of some **$60,000,000** spent for new or recent construction.

Outstanding Development Projects in the East

Perhaps no other school has undergone in the last few years so marked a transformation architecturally and otherwise as Phillips Academy, Andover, Mass. Abundant funds have made it possible to rearrange the campus at will. Plans for new buildings have been drawn by Charles A. Platt. Olmsted Brothers, landscape architects, of Boston, have had a representative on the grounds for the last eight years. Buildings have been put on rollers and moved about. Older buildings in the way have been torn down. Former buildings of the Theological School have been decapitated and reduced to harmonize with the Colonial atmosphere of the Academy plant.

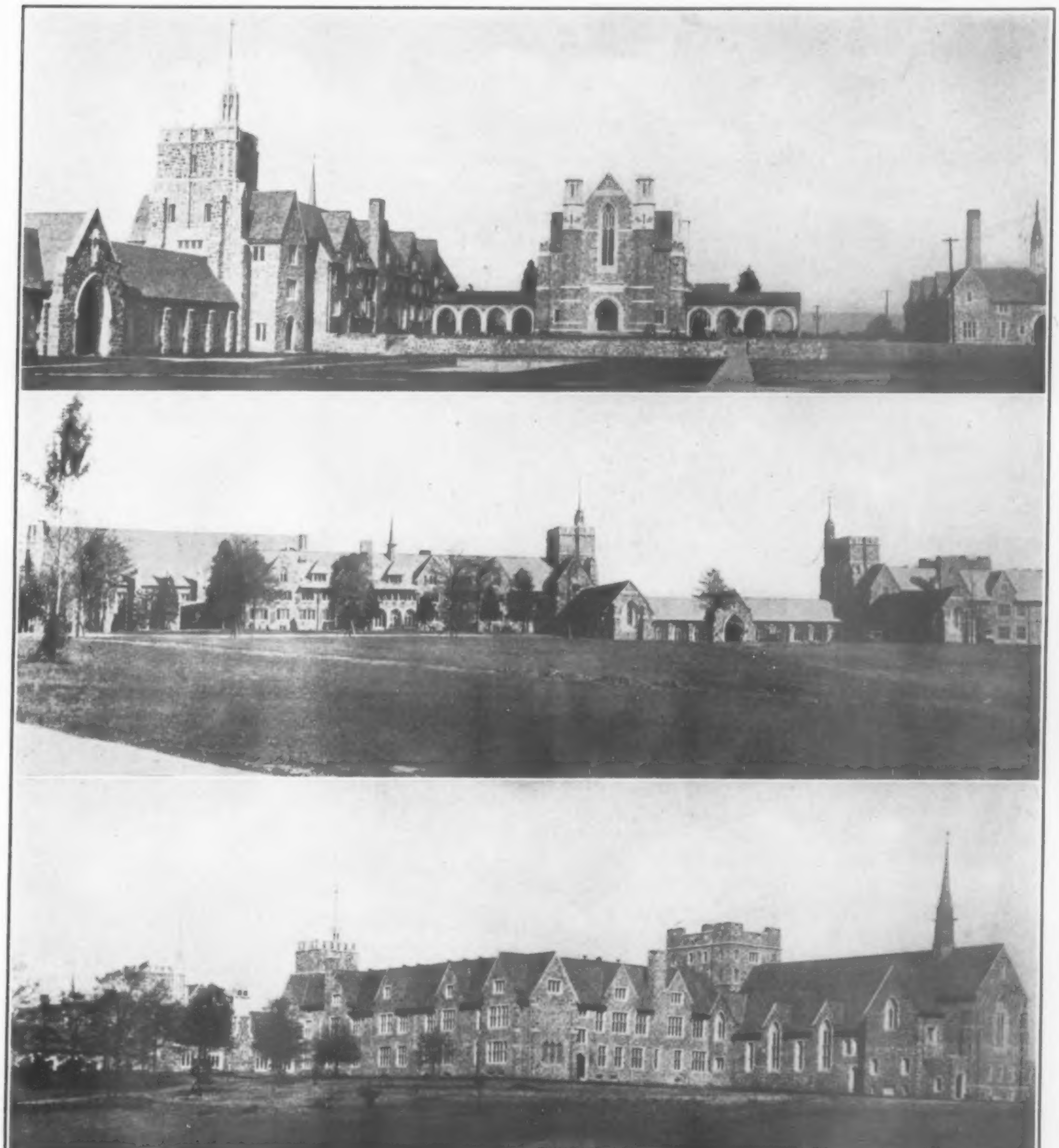
Phillips Exeter Academy, Exeter, N. H., has kept pace only a lap behind. Middlesex School, Concord, Mass., and the Lawrenceville (N. J.) School, having no quadrangles, are both planning new circles.

Expansion in the New York Capital District

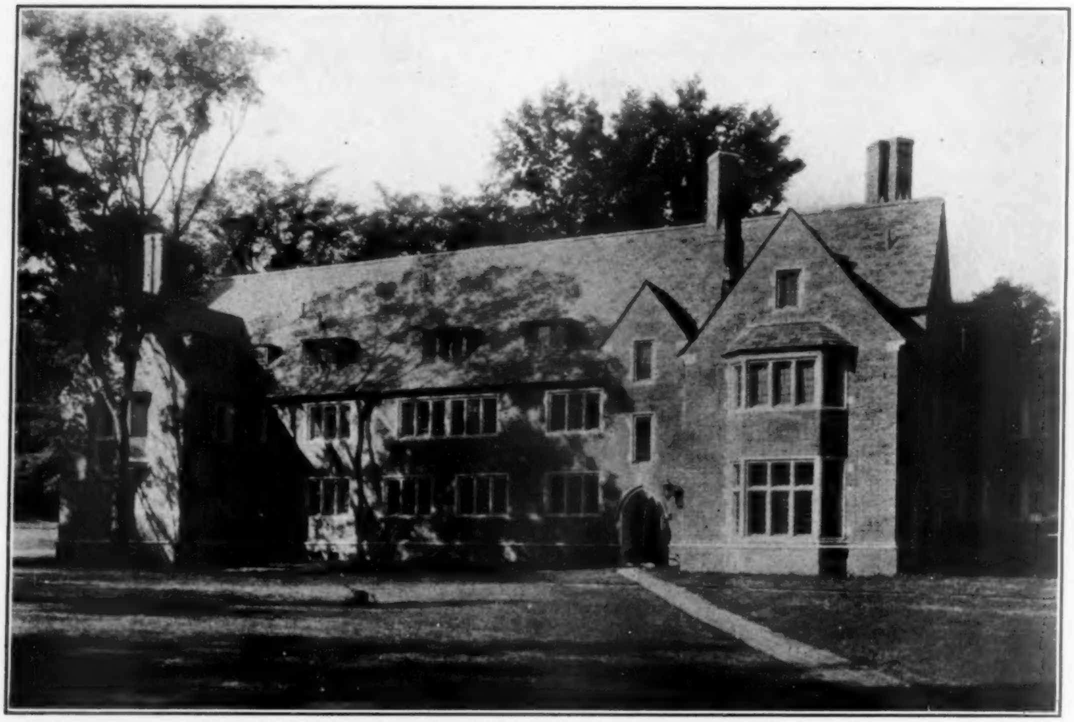
Albany is rapidly becoming an important educational center. Two of its old, prosperous schools of high scholastic standing, the Albany Academy for Boys and St. Agnes School for Girls, have recently acquired new country sites and are building complete new plants. Near at hand, the Troy Country Day School is of recent establishment. The Emma Willard School, near Troy, is a thriving school for girls. A little to the north is the Hoosac School, of large potentialities, and at Saratoga Springs, St. Faith's School is planning expansion.

In the Vicinity of Detroit and St. Louis

Detroit has two notable educational developments. Henry Ford's various enterprises at Dearborn have not taken on impressive architectural form as yet, though nearly 3,000 students are enrolled—the largest private school project in the country. To the north, the Booth enterprises at Cranbrook in Bloomfield Hills, influenced by their



THE MARTHA A. BERRY SCHOOL FOR GIRLS, ROME, GA.
Founded by Martha Berry for the children of mountain whites, this school has been liberally endowed by Mrs. Henry Ford



A DORMITORY AND ATTACHED MASTER'S HOUSE AT ST. PAUL'S SCHOOL, CONCORD, N. H.

founder, have given opportunity for a new style in architecture, developed by Eliel Saarinen, a Finnish architect. The buildings are decorated and embellished within and without by remarkable examples of craftsmanship of every sort.

The Principia, a school for the children of Christian Scientists, has raised an endowment of several million dollars and purchased a vast site on the Piasa bluffs of the Mississippi somewhat north of St. Louis. Here it plans to develop a four-year college.

Progress on the Pacific Coast

Two great new educational centers have developed within the past few years on either side of Los Angeles. Twenty-five miles to the east, within a few miles of each other, are a number of recent architectural groups housing Pomona College, the Girls' Collegiate School, and California Preparatory School. On the other side of Los Angeles, between that city and Santa Monica, an even more notable grouping has come into being. Here are the Westlake School for Girls and its affiliated Holmby College, Hollywood Military Academy, and the Urban Military Academy. The projected new plants of the Harvard School, St. John's Academy, and the Culver Art Center will also be in this region. Practically all of these institutions use a modified Mediterranean architecture, following the example of the early Spanish missions.

Colonial Architecture Dominant in the East

Many architectural styles are being used and have been used for private school buildings in this country. New buildings as a rule harmonize with the older buildings on a campus. Probably the Colonial style, particularly in its Georgian phase, is predominant. Most of the leading New England schools have some or all of their buildings in this style, as is natural. Deerfield Academy's new academy building by Charles A. Platt is notable, as also are the plants of Groton School and the Choate School.

Miss Hall's School, Pittsfield, Mass.; Phillips Academy, Andover; the new Brooks School, North Andover, Mass.; Middlesex School, Concord, Mass.; the Lawrenceville (N. J.) School; the William Penn Charter School, Germantown, Pa.; and the Louisville (Ky.) Collegiate School, are only a few of the private schools whose plants in the main follow Colonial designs.

The Baltic Style Is Unique

The Cranbrook Schools, Bloomfield Hills, Mich., probably furnish the only examples of the Baltic style in this country.

Notable Examples of Gothic

Good examples of the modern Gothic style in America are the chapels designed by Ralph Adams

Cram for The Mercersburg (Pa.) Academy, St. George's School, Newport, R. I., and the junior school buildings for St. Albans School, Washington, D. C., within the close of the Cathedral. Groton School's chapel, the gift of W. Amory Gardner, is a notable example of late decorated Gothic. The latest group of St. Paul's School, Concord, N. H., of which Charles Z. Klauder is supervising architect, is being carried out in Gothic to the last detail, even to the chimney of the heating plant.

Mediterranean Architecture Is Adapted to Different Regions

The use of stucco is characteristic of types of architecture that might be inclusively termed Mediterranean. This will be the style of the new plant of the Cambridge School in Weston, Mass., and was used for the Marjorie Webster School of Expression and Physical Education, Washington, D. C. Numerous California schools use modifications of this style, tending, of course to the Spanish, following the examples of the early Spanish missions. Schools in Arizona and New Mexico as naturally adapt Pueblo architecture to their needs.

STAIRWAY AND ENTRANCE TO THE DINING ROOM IN NORTH HALL, FERRY HALL, LAKE FOREST, ILL.

THE LOUNGE IN THE NEW NORTH HALL OF A SCHOOL FOR GIRLS IN LAKE FOREST, ILL.
These views illustrate the growing tendency towards urbanity and comfort in the designing of school interiors

THE ESTATE MANAGER'S HOUSE, AVON OLD FARMS, AVON, CONN.

THE PROVOST'S HOUSE AT AVON OLD FARMS

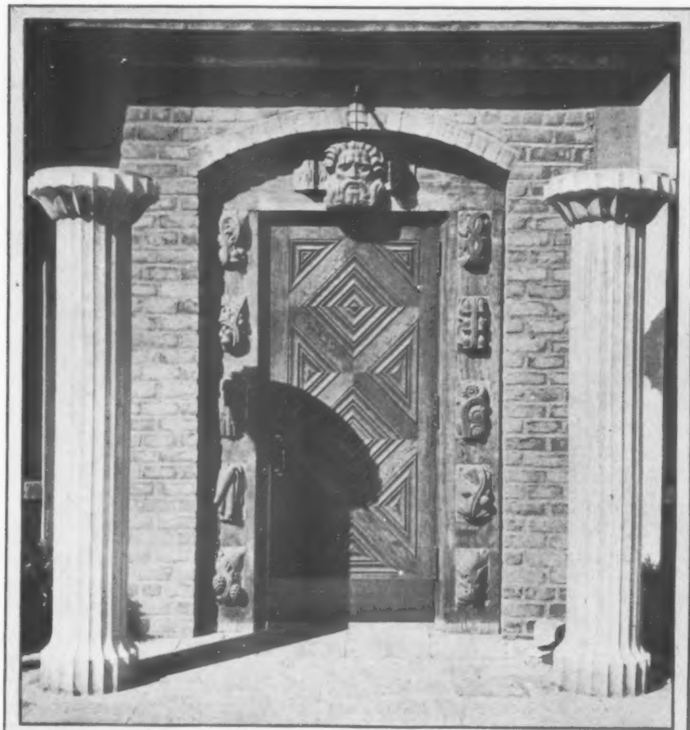
This school is organized like a small commonwealth, with boys for citizens. Work on the farm, in the carpentry shop and in the forest is part of their education. The buildings are planned to reproduce an English village of the Cotswolds

Other Styles Are Represented

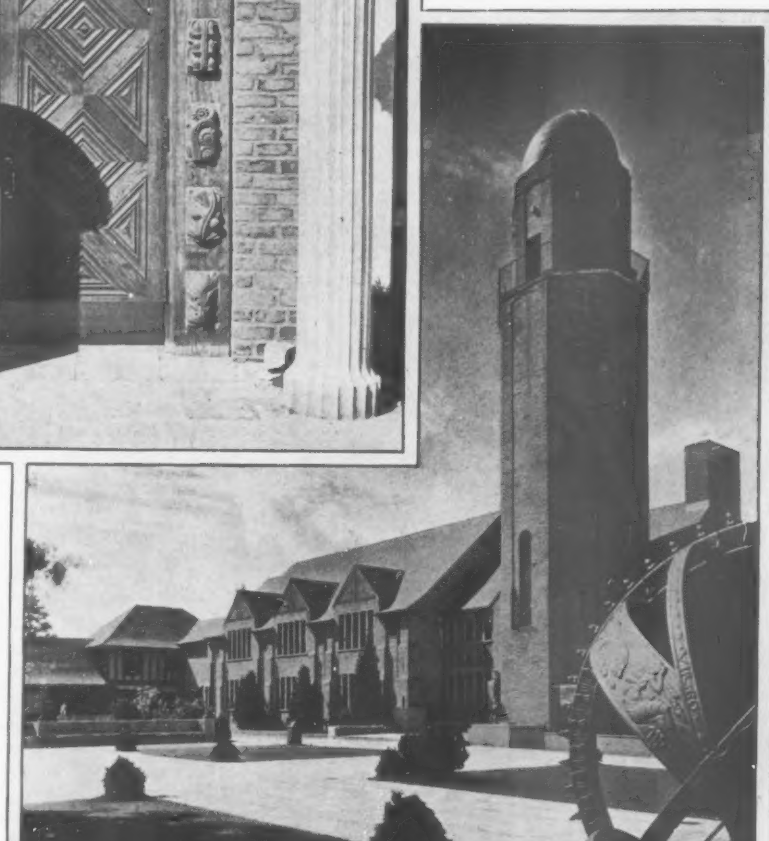
Avon Old Farms, Avon, Conn., the work of Theodate Pope Riddle, most effectively uses the Cotswold style in making the school as nearly like a village of southern England as practicable. Other rather unusual departures are the Tudor group being developed for Oak Grove Seminary, Vassalboro, Maine, by Coolidge and Carlson, of Boston, and the Early Norman Chapel recently designed for Kent School by Roger H. Bullard in association with Shreve, Lamb, and Harmon of New York.

School Buildings Are More Permanent

Fireproof construction and safeguards against fire are becoming the rule among the private schools. As a result, their new buildings, in which so much money and talent are invested, will be enduring monuments.



THE DOORWAY TO THE JUNIOR STUDY HALL OF CRANBROOK SCHOOL



THE ACADEMY BUILDING OF CRANBROOK SCHOOL, BLOOMFIELD HILLS, MICH., SHOWING THE OBSERVATORY TOWER, AND, AT THE RIGHT, PART OF AN ARMILLARY SPHERE DESIGNED BY PAUL MANSHIP

The Architectural League has awarded a gold medal to Eliel Saarinen, the architect, "for the distinguished quality of his work in the Cranbrook Foundation"

The Heating and Ventilating of School Buildings

BY F. MANSON WHITE
Architect

and

JAY H. KELLER
Consulting Engineer
Portland, Ore.

IMPORTANT among the many items that require concentrated thought in the design of school buildings is the heating and ventilating system. The building itself is but a shell to contain manufactured weather, the product of heat and ventilation.

The most modern methods now in practical use are the split system and the unit system. As most large cities have laws or ordinances governing the amount of air to be furnished each room, we shall not discuss that point, except to recommend that not less than 30 cubic feet per minute of fresh air be furnished for each occupant of a room.

The Two Modern Methods

In the split system of heating and ventilating, one or more large central fans, with accompanying heating coils, filters, washers, etc., are used to force fresh air through a system of ducts to each room to be ventilated. This air is automatically kept at a predetermined temperature. The heat losses from exposed walls and windows are taken care of by direct radiation from radiators placed along the walls. In the unit system, unit ventilators are placed in each room to be ventilated. The unit ventilators are individual fan and heating-coil units, automatically controlled so as to keep the volume of fresh air and the desired temperature of the room constant. For either system the authors recommend low-pressure steam as a heating medium.

With the split system, the air can be washed, the humidity regulated, and the intake placed at a point to receive the purest air. The air entering a room may be distributed as desired. The temperature of the incoming air is mild and not objectionably hot. All air-propelling machinery is located in a central position where it can be readily taken care of. There are no objectionable noises. The large steam lines are usually short runs to the steam coils, as the fan rooms are usually located near the boiler room.

Design Is Important in the Split System

When the split system is used, special care should be given the design, as the slightest error in duct size will cause trouble. Volume-dampers that register their position and that can be locked securely in any desired position should be installed in each room supply, preferably near the grill or outlet. We recommend that these damper quadrants be located within the reach of the person taking the anemometer readings of the grill; by this arrangement more accurate adjustments may be made.

The Unit System

When unit ventilators are used, the fresh air is taken through a grill located behind the unit. The grill should be placed above the ground surface, so that foul air from motor vehicles, as well as dust from the surface of the ground, will not be drawn through with the fresh air. If filters are used, they should be kept clean, as otherwise they become entirely filled and the air supply is cut off either partially or entirely. If unit heaters are used, we advocate the recirculating type, so that the air may be recirculated and the building more rapidly heated prior to occupancy.

Cloak Rooms, Halls and Toilets

In rooms having cloak rooms, the vitiated air should be taken from the floor, through the cloak rooms and then to the outside, via the attic space. The opening to the outside should have dampers so as to retain the heat within the building at night.

The advent of the platoon system in grade schools as well as high schools makes it absolutely necessary to heat and ventilate corridors and stair halls. The simplest method of doing this is to exhaust the air from the classrooms into the corridors and thence to the outside, augmented by direct radiation at exposed walls. The exhaust from the teachers' room, auditorium, gymnasium, domestic science room, manual training room and health room should go direct to the outside, not into the corridor.

Toilets should have direct radiation of heat, with a separate system of exhaust ventilation installed to exhaust at least 50 cubic feet per minute for each closet and urinal. Louvered openings permit air to enter the toilet rooms from the corridors, and yet prevent obnoxious odors from passing out to the corridors. These openings should be near the floor, of such size as not to create sufficient negative pressure within the toilet room to interfere with the closing of the doors. All janitor's closets, storerooms, etc., should be connected to this system of exhaust.

Auditoriums

Auditoriums should have a separate and individual heating and ventilating system. The split system is recommended because of the large volume of air to be handled. An auditorium should be treated like any theater or large assembly room.

The authors favor supplying air at the ceiling and exhausting it at the floor through floor mushrooms, or, where the expense does not justify this, air may be supplied at the rear of the room, at about the breathing line, and exhausted at the front under the stage. Radiators for the direct radiation of heat on exposed walls should be recessed, and they should not be concentrated into too large units, but spread along the entire wall.

Distribution and Fuel

It is customary now to use low-pressure boilers, with electrically driven auxiliaries. A two-pipe system of steam distribution should be used, an automatic return pump carrying the condensate back to the boilers. A vacuum pump is not necessary if the piping is properly designed and graded. It is worth remembering that every cent spent for steam-pipe covering is economy. The best covering is none too good. The authors recommend one-inch sectional 85 per cent magnesia covering on all steam lines. The return lines are left uncovered.

The question of fuel is purely a question of cost and varies with the locality. In most Oregon cities oil is the cheapest as well as the easiest fuel to handle, and it saves basement space.

Office Requirements of a High School Dean of Girls

BY SADIE B. CAMPBELL

DEAN OF WOMEN, IOWA STATE TEACHERS COLLEGE, CEDAR FALLS, IOWA

AND

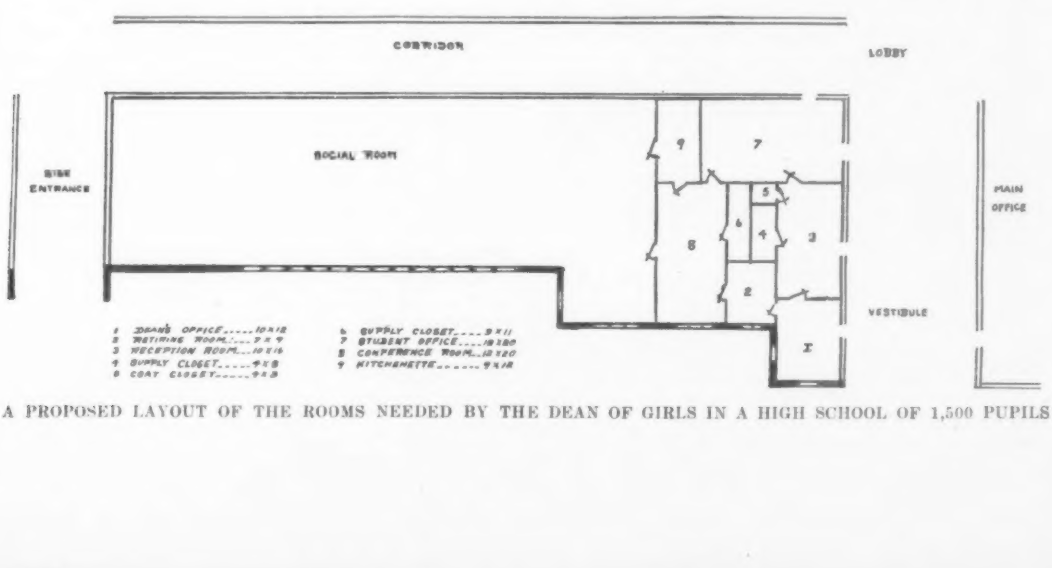
SARAH M. STURTEVANT

ASSOCIATE PROFESSOR OF EDUCATION, COLUMBIA UNIVERSITY

A RECENT study of the work of 100 high school deans, selected as representative of the best administrators in the field, shows that very few of them have office facilities adequate for carrying on the large program of individual and group activities which they report.*

It is obvious that when the dean has to use a classroom, or have her desk in a corridor or in a corner of the general office, "bounded on the north by a wall map of Europe, on the east by a wooden screen, on the south by the office counter and on the west by a coat rack," the best conditions for personal advisement, reported as consuming 23 per cent of her time, cannot obtain. Likewise it seems obvious that the dean of girls cannot conduct group conferences and train pupil officers in efficient and orderly business

* "A Personnel Study of Deans of Girls in High Schools," by Sarah M. Sturtevant and Ruth Strang. Bureau of Publications, Teachers College, Columbia University, 1929.



A PROPOSED LAYOUT OF THE ROOMS NEEDED BY THE DEAN OF GIRLS IN A HIGH SCHOOL OF 1,500 PUPILS

habits without sufficient physical equipment. Adequate equipment also reduces the strain that comes from working under more or less chaotic conditions.

It is the purpose of this article to consider the office layout necessary for the development of the dean's program in a high school of some 1,500 pupils. The findings of the study cited indicate that 23 per cent of a typical dean's time is given to personal advisement, 27 per cent to supervision of group activities, 3 per cent to the control of the physical environment, 11 per cent to the control of the intellectual environment, 14 per cent to miscellaneous marginal duties (such as informal contacts with students, teachers and parents; committee meetings, and conferences), and 10 per cent to the management of the office, which includes reading and answering correspondence, keeping records, writing reports, keeping accounts, and filing facts concerning individual pupils.

The dean's office, it can be seen from this summary, is primarily a service organization. Every detail, whether it be light, heat, ventilation, decorations, furnishing or records, has its social implications.

Pupils, faculty and the general public form the dean's clientele. In order to insure her the best conditions for carrying out such a program as that outlined above, it seems reasonable that she should have the following layout for her work:

1. A general reception room
2. A private office
3. A retiring room
4. A coat closet
5. A storage room
6. A conference room
7. A kitchenette
8. A student office

The accompanying plan suggests a practical arrangement.

To keep the dean's time free for the more constructive phases of her work, a full-time trained secretary, a part-time secretary, or a pupil trained for the work, as the case may be, presides in the general reception room, making appointments, answering the telephone and greeting guests. This room may also be used as a committee room, and it may serve as a place where the dean can entertain guests.

If the dean is to spend a fourth of her day on problems of personal advisement and in conference, she should have an office in which interviews can go on in private; most problems of personal advisement are too personal to discuss in an office where others are coming and going. Records not to be used by the pupils can be kept in files in the dean's office.

The dean as hostess of the building attends many social occasions and entertains many guests. Most of her work is with people and is highly fatiguing. Her hours are long. She often stays over for an evening party. She needs a place in which she can relax, clean up, and change her dress. A retiring room will easily pay for itself by making possible a happier adjustment to the day's work.

For preserving the sightliness of the offices, and for the convenience of the secretary and special guests, a coat closet will be a valuable addition. Better training in housekeeping methods and countless steps saved, justify the setting-aside of storage space for extra office supplies and for materials used by committees and by the dean in supervising the social program.

The supervision of the social program in a school of 1,500 includes the oversight of a great many pupil committees. If children are to learn to work together, they must practice working together under conditions of guidance. It is impractical to depend on meeting in classrooms, as they are usually in use during the same hours when pupil committees are working out their problems. For an efficient organization it seems highly desirable to have at least one conference room in the dean's suite for such committee meetings.

Part of the social training of boys and girls comes from practicing hospitality. A kitchenette is an intimate part of a laboratory in social training. If a large social room is nearby, the kitchenette can be planned to serve it as well.

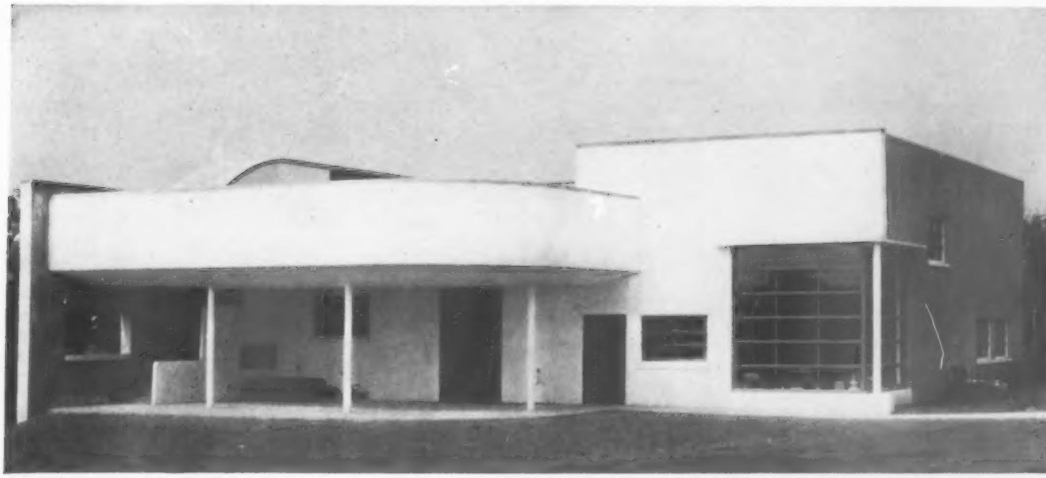
Another large obligation of the social program is to provide training in efficient business methods. In order to do that, proper facilities must be provided through which the officers of the major student organization can carry on their work in an efficient, businesslike manner. In a program encouraging wide student participation, a student office seems to be a necessity.

Among the important considerations which should be observed in planning the dean's office, after functions have been studied and a layout consistent with efficiency has been agreed upon, are these:

1. Careful attention should be paid to the location. The dean's office should be easily accessible to pupils, to faculty, to the registrar's office, to the principal's office and to the public. It should be located so as to be reasonably free from such annoyances as noise, smoke, dust, heat, shadows, vibrations. The location should be carefully planned with reference to expansion in later years.

2. The flow of work must be kept in mind. Openings and arrangements should preserve a straight-line flow to make for ease, efficiency and a minimum of noise.

3. It should be borne in mind that the office is a service organization, with far-reaching social implications. The activities which a dean supervises are a potential source of great influence in the lives of the students.



Howe & Lescaze, Architects *Photographs on this page by Ralph Steiner*

THE NURSERY BUILDING OF THE OAK LANE COUNTRY DAY SCHOOL NEAR PHILADELPHIA

Modernism in School Architecture

BY GEORGE HOWE
ARCHITECT, PHILADELPHIA, PA.

MODERNISM, whether in school or any other architecture, is a vague term covering a variety of tendencies. I must therefore begin by defining the sense in which I use it. I do not mean it to imply the mere change of fashion in external ornament represented by various and usually abortive styles of decoration, but rather that tendency toward simplification and rationalization which is evident as yet in only a few of our buildings.

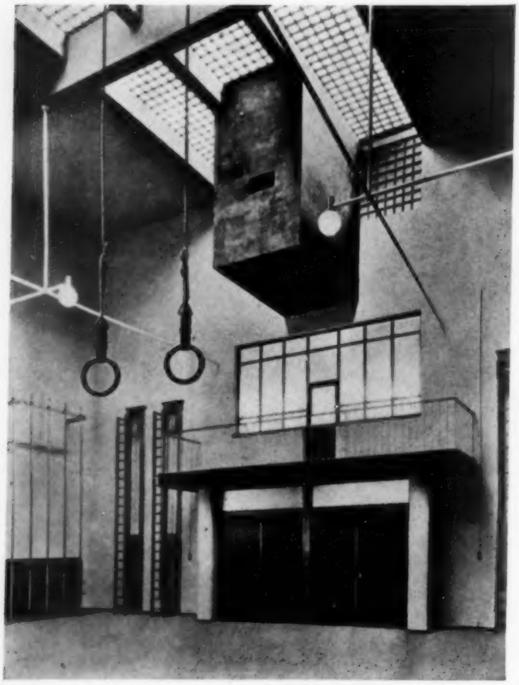
The Purpose of Modernism

Fundamental functional modifications in plan and construction have been brought about by developments in non-architectural fields, particularly the fields of science and its mechanical derivatives. The adequate solution of the problems presented by these new developments is the first purpose of modernism. In the broadest sense, therefore, any school building or group that is well-arranged and well-equipped may be said to be modernistic, whether its external expression be of traditional inspiration or not. Why, then, the conservative may ask, try to establish a new tradition of expression, when the past offers such a rich vocabulary?

Unity of Thought and Expression is Necessary

The possible answers are many, but they all lead back to the same source. The motive for establishing a new tradition of expression is the natural human desire to turn a mere tool into a work of art. A work of art, whatever its inspiration, must of necessity be free from the confusion which follows when the traditional forms of one age are used to convey the ideas of a later and more com-

A CORNER OF A CLASSROOM IN THE OAK LANE COUNTRY DAY SCHOOL



O. Haesler, Architect

INTERIOR OF THE GYMNASIUM OF A SCHOOL AT CELLE, GERMANY

plex civilization. A scientific treatise cannot be couched in Shakespearean blank verse without doing violence to the one or the other. That unity of thought and expression which we all learned is so essential in a schoolboy's composition is also necessary in a scientific treatise, and it is necessary as well in a work of architecture which is to satisfy our esthetic sense.

Science Prescribes the Form of the Modern School

The architect is never free to choose his subject matter; his thought must form itself around the human problems which are presented to him for solution. In the case of school buildings, the modern scientific approach to education determines absolutely the purpose, form and distribution of rooms; the size and location of openings; the nature of furniture and equipment; the texture of walls and floors; the design of the mechanical plant; the arrangement of playgrounds and athletic fields; and all the other essential elements of the problem. This scientific approach may be called, in the terms of an architectural program, a mandatory condition. Any designer who attempted to make out a case against it, or for the technology of the little red schoolhouse and the monastic institution, would be laughed out of court. Scientific modern education and its implementation, as differentiated from classic cultural tradition, must therefore be accepted by the architect as the central thought whose unity he must preserve internally and externally throughout his composition.

Unity Is Impossible with Inappropriate Forms of Expression

The thought must lead naturally and inevitably to its expression. Every attempt to force the modern school into traditional forms has been only partially successful. Exigencies of plan and fenestration distort the harmonious masses and destroy the serene wall surfaces of the accepted styles. The coved angles, the smooth walls and floors, and the mechanically effective furniture of modern interiors clash with the mellow texture and detail of archaeological exteriors, with the result that our pleasure in both is destroyed. However beautiful inappropriate forms of expression may be in themselves, to impose them on a

Photograph by Underwood & Underwood

THE NEW SCHOOL FOR SOCIAL RESEARCH, NEW YORK CITY

The building material is black and white brick. The banded treatment of glass and brick is the result of planning for the most possible window lighting. Joseph Urban is the architect

designer's thought hampers his freedom and muddies the clear waters of his inspiration. In order to restore artistic unity it is necessary to adapt expression to its subject.

Beauty Is Achieved Through Unity

The new expression in school architecture, then, follows the thought of modern education in being simple, direct and scientific within the limitations of the human problem. It does not on that account disregard beauty, but aims, on the contrary, to achieve beauty through unity. Beauty is infinite in its variety and may be found as well in a slender steel column or a smooth area of glass as in a masonry pier or a richly colored wall surface. Today, in-

Photograph by Underwood and Underwood

THE LIBRARY OF THE NEW SCHOOL OF SOCIAL RESEARCH
Stacks accommodating 15,000 volumes are located beyond the double flight of stairs which leads to the art exhibition room. All the lighting is indirect

Photograph by Nyholm & Lincoln

THE AUDITORIUM OF THE NEW SCHOOL FOR SOCIAL RESEARCH
The oval shape was employed to provide maximum seating with maximum visibility. The seating capacity is 550. The stepped treatment of the dome conceals floodlights and reflectors. The ceiling is made of perforated plaster, from which there can be no sound reflection, and through which vitiated air is exhausted

deed, beauty can be found in these modern elements whenever they correspond to vital human needs and are proportioned to their purposes and structural significance with the same intelligence as were the traditional elements in the day when they also were modern.

The Exterior Expresses the Interior

The new expression has the further advantage of allowing complete liberty of action in the development of internal school functions without the sacrifice of architectural unity. Exterior can be a direct expression of interior. Large areas of floor space develop into bold flat-decked masses unencumbered by overpowering roofs; they are adapted equally to symmetrical or asymmetrical composition. Openings of any size may be distributed where required, with all the freedom gained by the use of steel and concrete. Clean surfaces and simplified detail clash neither with scientifically conceived interiors nor with the goal posts, backstops and bleachers of athletic fields. Utilitarian and esthetic elements are brought into harmony. Thought and style are molded from the same subject matter.

Modernism Is a Natural Evolution

The modernist method of approach to the architectural problem is neither original nor revolutionary. It is only a conscious application of the unconscious method of our forefathers who expressed their simple needs in simple and unaffected architectural forms. If the resultant forms are different and more complex today, it is only because our problems and the means of solution at our disposal have undergone a process of evolution. The simple structural cell or group of cells of the past has developed into a complex organism with lungs and arteries, a skeleton and a thin outer skin. The development of this architectural monster has been somewhat over-rapid and it is not surprising that it has suffered strange metamorphoses in the process. At last, however, it seems to be assuming the aspect of a type in a few isolated specimens. The free evolutionary tendency of this type is what I refer to as modernism. It seems to be gaining momentum, and promises, I believe, a new period of architectural freedom both to the educator and to the designer.

Plumbing Standards and Their Relation to School Efficiency

BY ERIK A. ANDERSEN

DEPUTY SUPERINTENDENT OF SCHOOLS, PROVIDENCE, R. I.

THE health and educational implications of plumbing standards require careful and serious consideration in the preparation of plans for new buildings and the rehabilitation of old buildings.

Recent studies of plumbing furnish school superintendents and architects with excellent sources of information for an intelligent selection of plumbing materials and fixtures. An examination of these studies indicates that such significant factors as simplicity, accessibility, durability, imperviousness to moisture, non-absorption, appearance, and maintenance are definitely related to sanitation and educational efficiency.

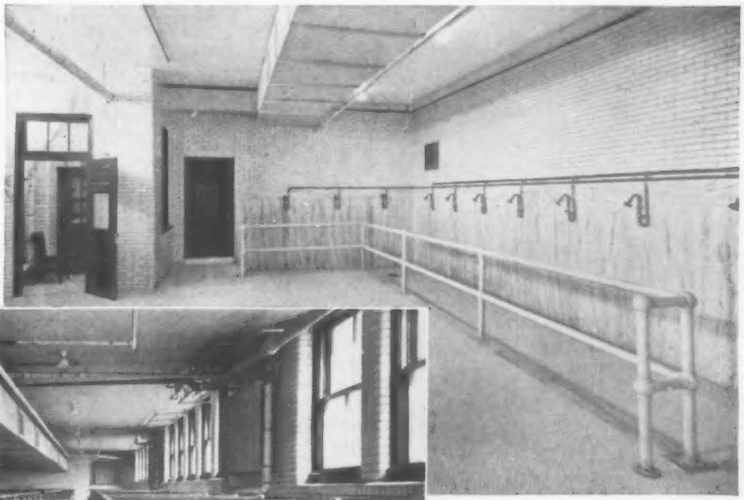
It is not the purpose of this article to restate the findings of such authorities as Dr. George D. Strayer and Dr. N. L. Engelhardt, or to go into details regarding the importance of the criteria and checking lists which have been presented so completely by Minor Wine Thomas in his "Public School Plumbing Equipment," a Columbia University Teachers College publication, and in previous issues of THE AMERICAN SCHOOL AND UNIVERSITY. Nor is it the purpose of this article to furnish lists of the needs of rooms or laboratories in school buildings, as this need can best be met in each school system by making a careful and complete analysis of every activity in the program. The type of equipment and the facilities to be provided can be determined only by a critical and thorough study of pupil needs, programs of work, and all the experiences that are a part of the daily school life of the child.

Two Questions to Ask

In considering plumbing, school superintendents should endeavor to answer two questions: (1) What are the health and educational needs of pupils in every room in the elementary school, junior high school, senior high school and special school? (2) What plumbing equipment is necessary to meet these needs conveniently and efficiently? A study based on these two questions will not only reveal needs, but help to determine what sanitary conveniences should be provided to safeguard the health of the children. This type of study will also direct attention towards an increased school efficiency which includes such important factors as reduction of pupil travel and economy of time.

It is difficult to justify some of the elaborate plumbing installations that have been made in school buildings at enormous expense. It is even more difficult, however, to justify the omission of much-needed facilities in new buildings because of loose, careless planning or lack of knowledge on the part of school authorities.

AT RIGHT—BOYS' SHOWER AND DRYING ROOM, NATHAN BISHOP JUNIOR HIGH SCHOOL, PROVIDENCE, R. I.



AT LEFT—THE DRESSING COMPARTMENTS AND SHOWER STALLS OF THE GIRLS' SHOWER ROOM, NATHAN BISHOP JUNIOR HIGH SCHOOL

School Conditions Inferior to Those in Industry

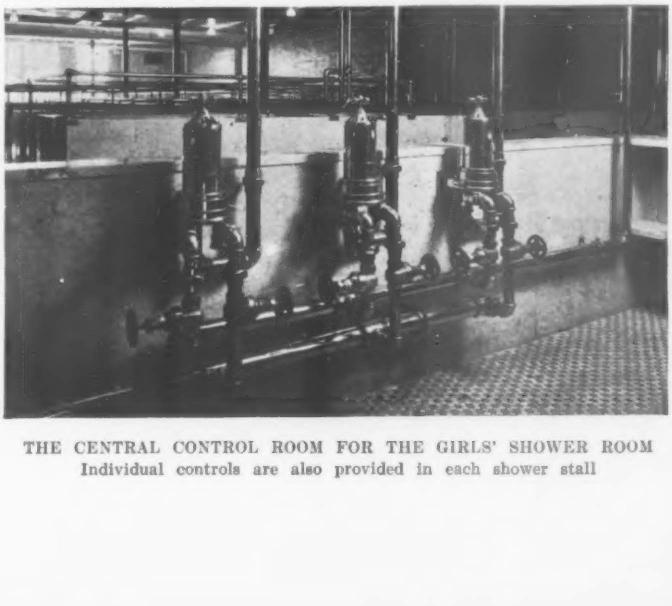
Those engaged in school work have frequently been forced to accept conditions that would not be tolerated in a modern progressive industrial concern. In business, the element of competition is so keen that no concern attempts to run without necessary facilities. A business organization cannot afford to continue the use of obsolete equipment. Employers recognize that regard for the health and safety of their workers is an important link in the chain of efficiency.

School officials and others responsible for school buildings can no longer expect to conduct school systems on an efficient basis if they accept obsolete, inadequate facilities. In this respect a school superintendent renders invaluable service to education in proportion to the degree of success he achieves in arousing in the public a demand for higher standards in the construction of school buildings.

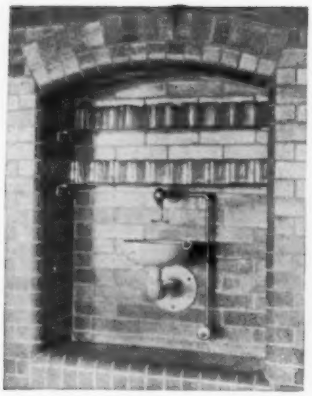
Architects and contractors have been known to point with pride to plumbing installations of which the original cost was exceedingly low. Inspection of the buildings in question usually discloses a lack of necessary facilities and a substitution of inferior materials. Comparisons of installations on a cost basis without investigation often affect worthy projects in neighboring communities and result in unsatisfactory compromises. The original cost of first-quality equipment and materials may be slightly more, but the savings in maintenance costs and improved efficiency justify the expenditure.

Cooperation with Architects Vital

School officials should be urged to cooperate closely with school architects during the period when plans are being prepared and, when neces-



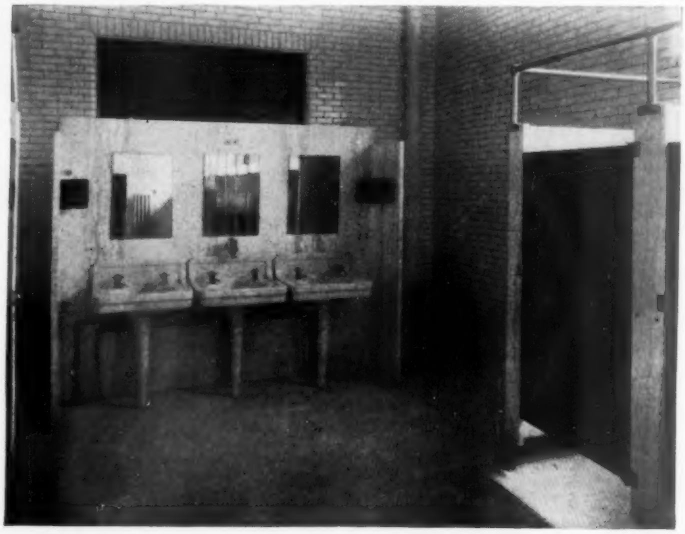
THE CENTRAL CONTROL ROOM FOR THE GIRLS' SHOWER ROOM
Individual controls are also provided in each shower stall

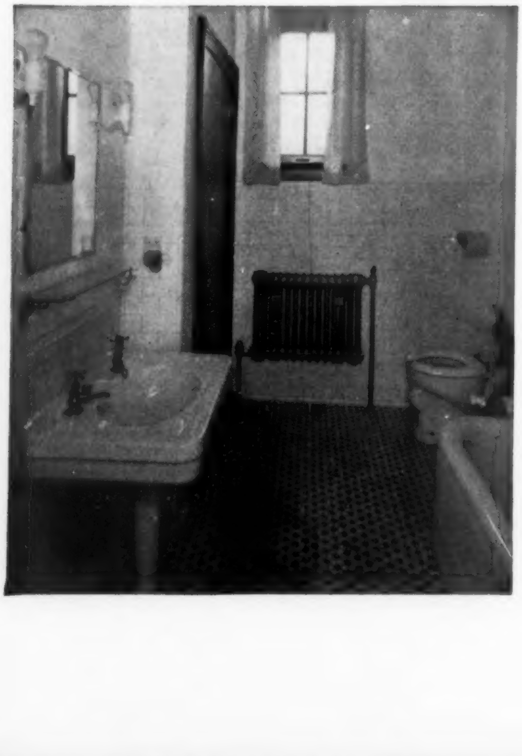


sary, to enlist the aid of educational experts in the school-building field who are in a position to furnish helpful advice and assistance.

It is indeed a sad commentary on present procedures in educational systems in this country that so many new buildings lack the ordinary facilities required for a modern educational program, including those which are also needed to safeguard children's health. To illustrate: one does not have to travel far to find science, chemistry, and other laboratories in new buildings with plumbing facilities sufficient for several schools, while in the same buildings large gymnasiums have extremely limited shower facilities.

THESE PHOTOGRAPHS OF PLUMBING INSTALLATIONS IN THE NATHAN BISHOP JUNIOR HIGH SCHOOL, PROVIDENCE, R. I., SHOW, ABOVE, A WALL-RECESSED DRINKING FOUNTAIN AND A WALL-RECESSED GLASS FILLER. AT THE RIGHT IS A VIEW OF ONE OF THE GIRLS' TOILET ROOMS. BELOW IS THE MODEL BATHROOM IN THE HOME ECONOMICS SUITE





Adequate Shower Rooms Necessary

In planning a new building it is not a difficult problem to assign near the gynasium a room large enough for dressing purposes and for an adequate number of showers, in a part of the building which is well lighted and ventilated and which would not ordinarily be used for classroom purposes. If the school program requires 80 pupils to be on the gymnasium floor in one period, it should be possible for the whole group to undress and take their hot and cold showers at the same time if the maximum part of the period is to be devoted to instruction.

In the new junior high schools in Providence, the girls' shower rooms are equipped with 86 marble dressing stalls connected with 86 individual marble shower stalls. The shower heads are at shoulder height and are operated from a central control. Separate controls are also provided in each stall. It is thus possible to reduce to a minimum the time required for dressing and undressing and the actual taking of showers.

It can hardly be expected that showers will be

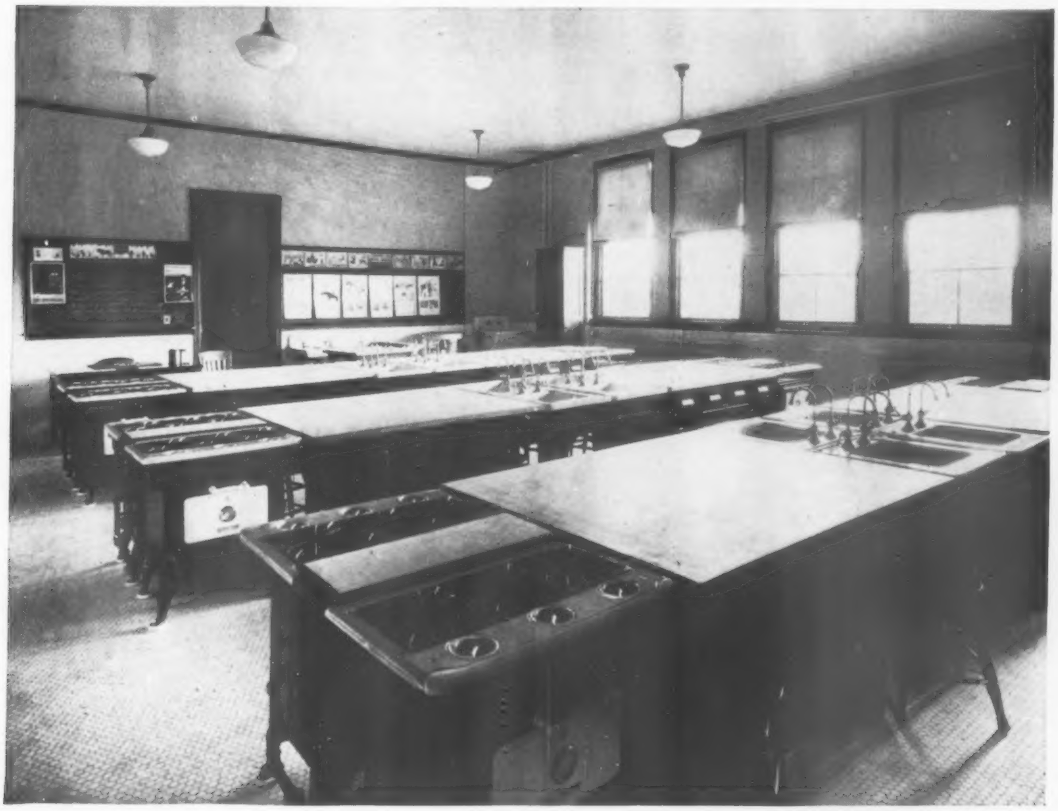
generally used unless towels are provided. These should be furnished and laundered by the school without cost to the pupil. It is practical to equip a small room as a laundry with a wood washer, a curb extractor, and a drying tumbler. The room should be located near the showers and may be operated by an attendant, who could also take charge of the girls' shower room.

Location of Toilets and Fixtures

The distribution of an adequate number of wall-recessed, sanitary drinking fountains in the corridors, and the placement of well-lighted toilet rooms on every floor in convenient locations near stairways and classrooms, makes not only for better health but also for better administration in reducing congestion and travel. Children enjoy using attractive, adequate, and accessible facilities which make their own contribution to personal hygiene and health.

In a modern elementary school a lavatory in every classroom may not be a wasteful expenditure, but more often becomes an actual necessity. Children use paints, leather, reed, and other materials which require the use of water for instruction as well as for sanitary purposes.

After the school officials have determined by actual analysis the plumbing needs of the school program and have checked their findings, it becomes the duty of the architect to incorporate all these requirements in his plans in the most economical manner. Installation and maintenance costs must constantly be balanced in choosing equipment. It is highly desirable that as far as possible the first cost should be the last. All plumbing fixtures should be drawn to scale on the plans and shown in their exact location. If this practice were more generally followed, the greater part of the cutting and patching in new construction would be rendered unnecessary.



THE HOME ECONOMICS ROOM OF THE NATHAN BISHOP JUNIOR HIGH SCHOOL, SHOWING THE ARRANGEMENT OF SINKS AND LAUNDRY FACILITIES

Pipe Lines Often Poorly Located

It is difficult to understand why home economics, science, and chemistry rooms, as well as other laboratories which require a considerable amount of plumbing, should be scattered about school buildings, usually on upper floors, without regard for the long supply and waste lines that are required. These long lines not only add to the original building costs, but also present a maintenance problem. If thought is given to the assignment of rooms, it is possible to stack plumbing lines and eliminate many of the long, ex-

pensive runs of pipe. All supply and waste pipes should be readily accessible to facilitate repairs. When wall chases are properly located, these repairs can easily be made by removing wood, metal, or brick panels. Provision should also be made for future extensions to plumbing systems, in order to eliminate the necessity for changing sizes of supply pipes and for cutting into lines, thereby adding to the cost of later installations.

Improvements in Equipment

Manufacturers are making progress in their lines which is worthy of mention. Vitreous china has replaced porcelain; chromium plating is accepted as superior to the customary nickel finish; monel metal is used on working surfaces which require a rust-proof, durable metal. Ceramic tile floors set in waterproof cement, and glazed brick or tile walls, are now specified as standard materials. These few illustrations are typical of the contributions that are being made by manufacturers in their efforts to cooperate with those school officials who are concerned about raising health standards. Many school systems have been slow to accept changes in specifications, largely because of inertia or tradition, although the standards for schoolhouse construction have greatly improved on account of the very far-reaching effects of the survey movement.

Flushing devices have greatly improved in recent years, although the objection still remains that children's hands must come in contact with flushing levers. It remains for some ingenious person to perfect the foot-operated control in order that it may be positive in action, simple in construction, easily maintained, and attached to all fixtures.

Humidifying the Air of Classrooms

A problem of health that involves the welfare of school children, and one which so far has received but little attention, is the provision for the proper amount of moisture in the air of the schoolroom, especially during the winter months. Health authorities agree that many forms of respiratory diseases prevalent among children can often be traced to the lack of moisture as well as to the overheating of the air in schoolrooms. It is possible in a plenum system to draw the air through continuous streams of water, which can be regulated and which restore the moisture content necessary to health and comfort. For smaller buildings the problem remains as a challenge to some engineer to develop a satisfactory way of meeting the situation.

Study Individual Needs

More time and study must be given to the needs of each individual pupil in each individual room and laboratory if modern education is to realize its ideals. Build the school around the program. Provide the drinking fountains and the fixtures that invite use, in order that children may form right habits that relate to personal hygiene. Provide adequate equipment and facilities, so that the program may be effectively administered.

PITTSBURGH REFLECTOR COMPANY

304 Ross Street — Pittsburgh, Pa.

Manufacturers of "Permaflectors" the Silver-Plated Glass Reflectors for Practically Every School Lighting Need

PERMAFLECTOR LIGHTING FOR SCHOOLS AND COLLEGES

Just what constitutes good lighting for schools is a question, the answer to which entails four definite and equally important factors. They are (1) Adequate Light; (2) Complete Distribution; (3) Avoidance of Glare; (4) Proper Diffusion.

Insufficient light is productive of eye-strain, fatigue and consequent poor work, and may be the cause of permanent eye defects. The intensity of light must be evenly spread to all parts of the school room. It is extremely important that any glare be

CLASS ROOMS
Permaflectors in special indirect fixtures, University of Washington, Seattle. Note the even distribution of well-diffused light.

LECTURE HALLS
Soft, shadowless illumination, from Permaflectors in special wall urns and indirect fixtures. Lecture hall in the Physics Building, University of Washington.

LIBRARIES
For the lighting of libraries or reading rooms, there is no better method than from coves or other concealed sources. No glare or bothersome shadows.

LABORATORIES
Laboratory in the Physics Building, University of Washington, where Permaflectors are used in special indirect fixtures throughout the building, with the exception of a few apparatus rooms.

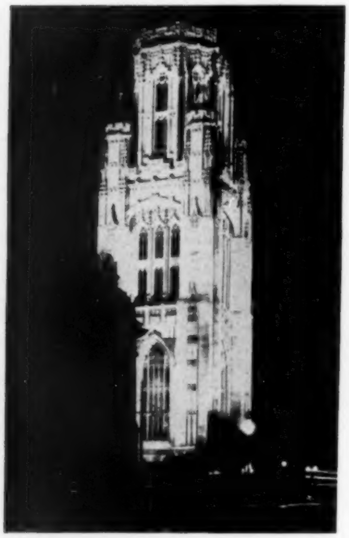
OFFICES
Permaflector Indirect Luminaire B-5—an ideal, low-cost unit for the lighting of school offices, providing an exceptionally wide distribution of well-diffused light.

ART GALLERIES
Artificial lighting from Permaflectors mounted above skylight. Henry Art Gallery, University of Washington, Seattle.

ties are invited to consult our Engineering Department in regard to lighting of class rooms, auditoriums, libraries, swimming pools, gymnasiums, art galleries, laboratories, lecture halls, exterior floodlighting of buildings and recreational areas—in fact, any lighting problem in connection with an educational institution.

Write for a copy of Permaflector Lighting Catalog, which illustrates and describes the complete Permaflector line. This book contains much valuable information regarding general lighting practice, with technical data as well as illustrations of actual applications.

We also have available a booklet dealing with the specific lighting problems of a school or university, which is free for the asking to anyone interested in the subject. Ask for Permaflector Lighting, School and College Number.



FLOODLIGHTING
Many schools and colleges have come to realize the benefits to be derived from the use of floodlighting—especially from the standpoint of advertising and civic pride. Bristol University, Bristol, England (left), and Westminster College, New Wilmington, Pa. (right), employ Permaflector Floodlighting, not only as a medium of advertising, but to aid in arousing affection and loyalty for the school in the hearts of students as well as residents of the community.

"Pittsburgh"
Permaflectors

AUDITORIUM AND STAGE LIGHTING

(Left) Permaflector Lighting for stages, showing Permaflector Footlights and Border Lights and a Permaflector Floodlight used for emergency light. (Right) Combination auditorium-gymnasium, lighted from Permaflectors countersunk in ceiling, fitted with stippled glass roundels.

entirely eliminated. Care should be exercised so as not to produce sharp shadows or harsh contrasts in the illumination.

Permaflector Lighting is engineered lighting, carefully planned and designed for the particular purpose for which it is intended.

After more than twenty years' experience in practically all phases of illumination, the Permaflector Engineering Department has accumulated a comprehensive knowledge of illumination problems, which enables them to be of considerable assistance to anyone desiring such information. The Permaflector line is a complete one, comprising more than 50 different designs of silver-plated glass reflectors, each one of which is particularly adapted to a specific lighting application.

Architects, builders and school authori-

AUDITORIUMS

This auditorium in the High School at Carmichaels, Pa., is lighted in color by Permaflectors in coves. Note the even distribution of soft yet high-intensity illumination.

GYMNASIUMS

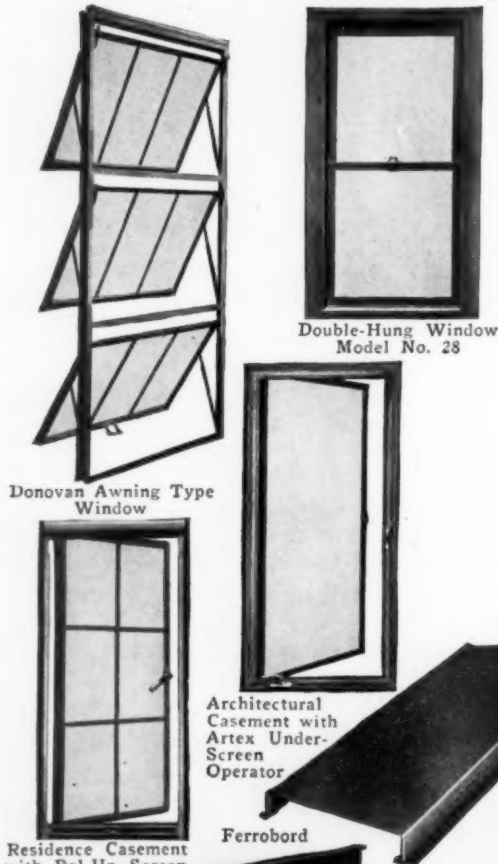
Permaflectors mounted flush in the ceiling furnish ideal illumination for gymnasiums with comparatively low ceiling height. Wire guards protect the reflectors from breakage.

TRUSCON STEEL COMPANY

Youngstown, Ohio

Engineering and Sales Offices in All Principal Cities
PLANTS IN: Youngstown, Cleveland, Detroit, Los Angeles, Walkerville, Japan

Manufacturers of a Complete Line of
STEEL BUILDING PRODUCTS FOR SCHOOLS

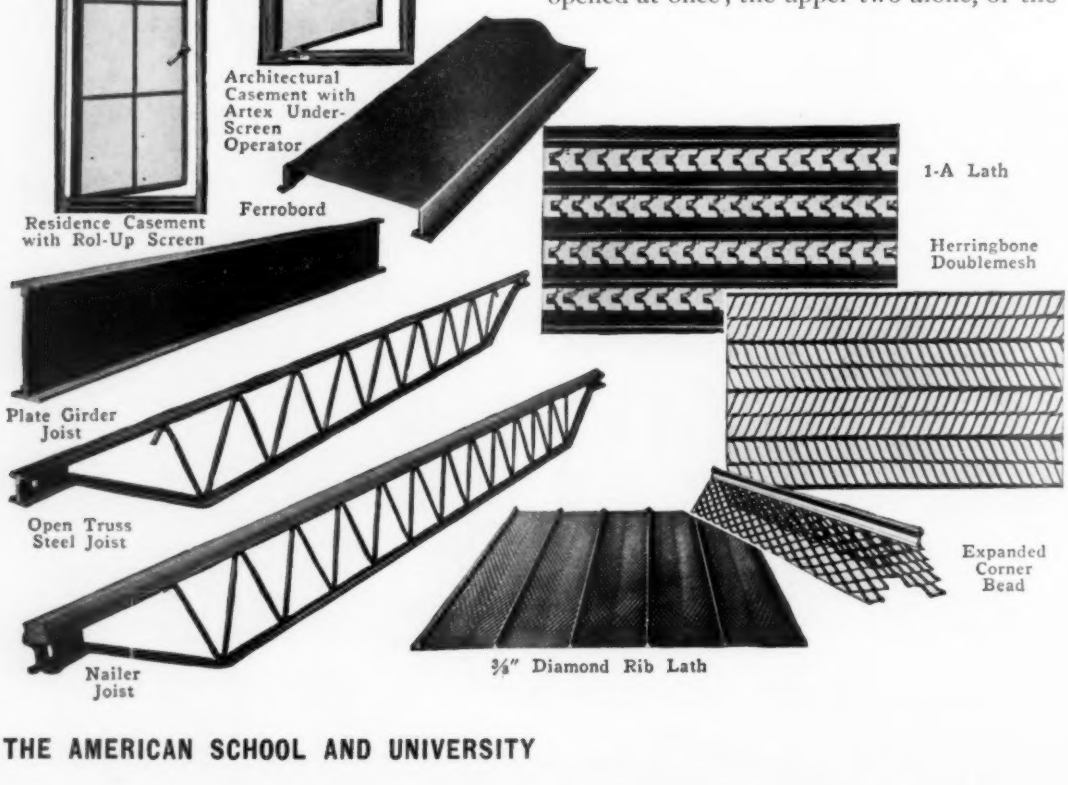


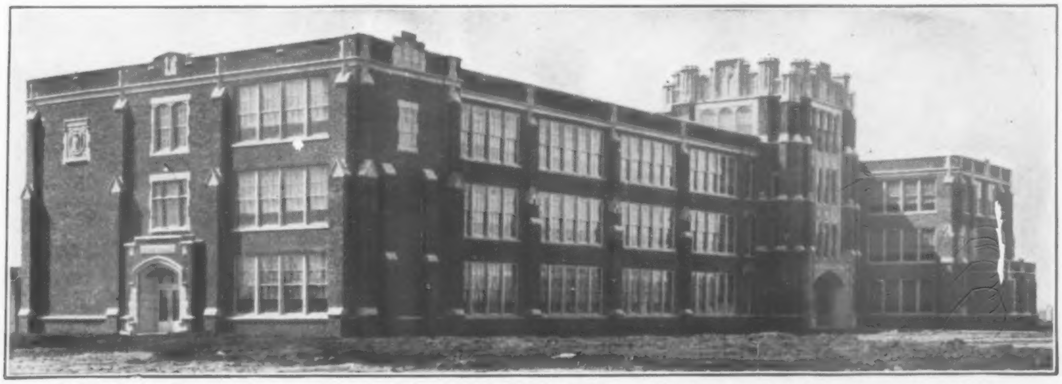
TRUSCON STEEL BUILDING PRODUCTS

contribute to the beauty, efficiency and permanence of educational buildings of every kind throughout America. Developed and tested by years of actual use, they have earned the high regard of administrators and architects through quality and service. All parts of the buildings, windows, walls and ceilings, floors and roofs, are constructed with these permanent building products.

The Windows

Truscon Donovan Awning Type Steel Windows are especially recommended for classrooms. In addition to being fireproof, they provide proper ventilation without draughts and diffused lighting without glare. The lower sash controls the movement of the upper sash. All sashes may be opened at once; the upper two alone, or the





NORTH PLATTE HIGH SCHOOL, NORTH PLATTE, NEBR. Meginnis and Schaumberg, Architects

lower sash opened. Furnished in two or three light high units.

Other popular windows for schools are: Truscon Double-Hung Steel Windows adapted for the finest buildings through superior workmanship, finish and hardware; Truscon Steel Casements in Residential and Architectural Types with Rol-up Screens or Side-Hinged Screens with Artex Under-Screen Operators. Made in standard sizes and stocked in Truscon Warehouses for immediate delivery.

The Roof

Truscon Steeldeck Roofs, properly insulated and waterproofed, are firesafe and practically free from maintenance expense. Furnished in three types, I-Plate, Ferrobord and Ferrodeck, each adapted to specific requirements. Whether for new construction or replacement work, there is a permanent, economical Truscon Steeldeck for every type of building.

HUTCHINSON MEMORIAL MEDICAL CLINIC, TULANE UNIVERSITY, NEW ORLEANS, LA.
Favrot and Livaudais, Ltd., Architects

ANN J. KELLOGG SCHOOL, BATTLE CREEK, MICH. Albert Kahn, Inc., Architects

ANDREWS HALL, LINCOLN, NEBR.
Davis and Wilson, Architects

HARRISON MORTON SCHOOL, ALLENTOWN, PA.
Jacoby and Everett, Architects

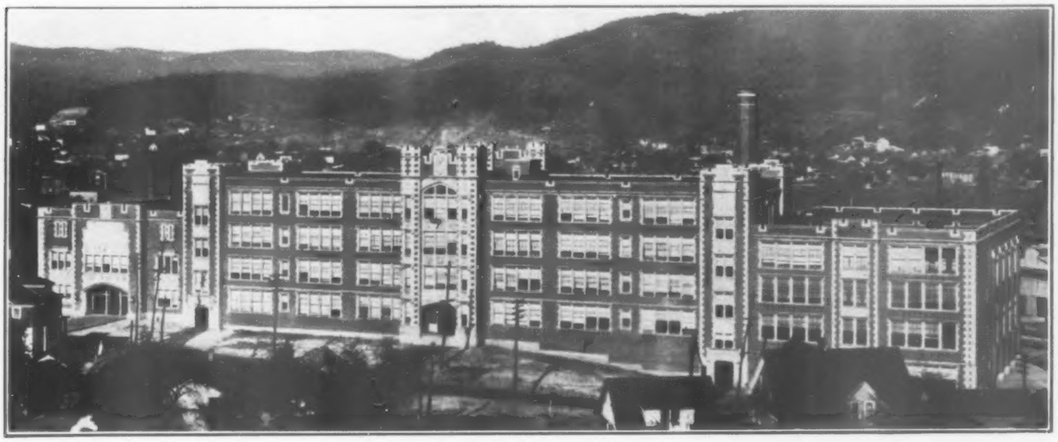
The Floor

Truscon Steel Joists in three types, Open-Truss, Plate Girder and Nailer, insure fireproof, strong, rigid and soundproof floors —quickly erected without forms or centering. The light weight of the Open-Truss Joist saves in the supporting structure, thus adding to the economy of its low initial cost.

The Walls and Ceilings

Truscon Metal Laths and Cornerbeads safeguard walls and ceilings from the disfigurement of cracks. They also provide an effective fire stop. Among the popular

LOOKOUT MOUNTAIN GRAMMAR SCHOOL, LOOKOUT MOUNTAIN, TENN.
Clarence T. Jones, Architect



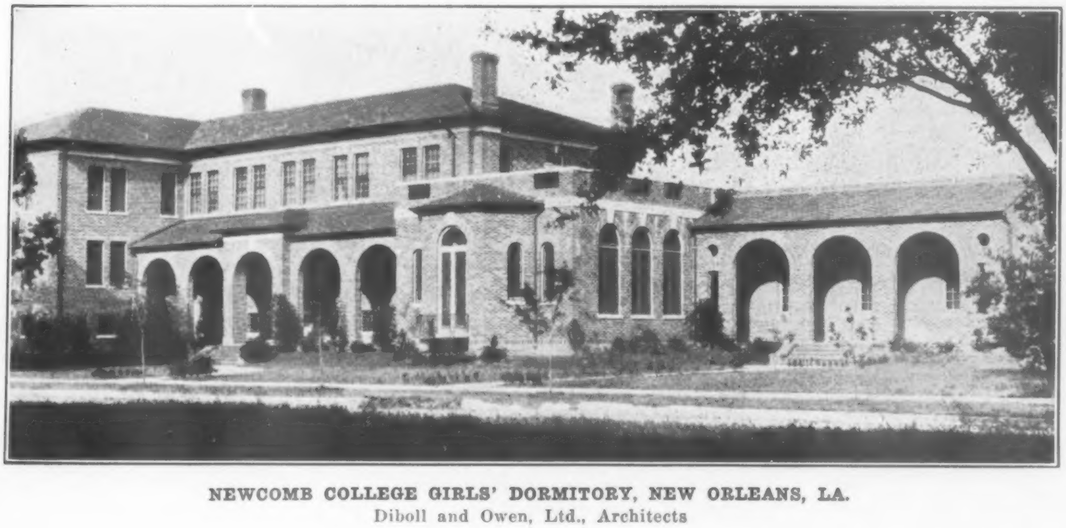
GARFIELD HIGH SCHOOL, JOHNSTOWN, PA.
J. E. Adams, Architect

types are A Laths, Diamond "A," Herringbone Doublemesh and Diamond Laths, ¾" Hy-Rib, Self-Sentering and Trussit, Cornerbeads, Cornerite and Channels.

More complete description of these and other Truscon contributions to the construction of representative American school, college and university buildings will be furnished promptly on request. Truscon engineers are available in all principal cities to render skilled assistance in solving building problems of every kind.

Write for informative literature.
Your inquiry entails no obligation.

CARPENTER STREET SCHOOL, WOODBURY, N. J.
Ballinger Company, Architects



NEWCOMB COLLEGE GIRLS' DORMITORY, NEW ORLEANS, LA.
Diboll and Owen, Ltd., Architects

CONGOLEUM-NAIRN INC.

General Office: Kearny, New Jersey

SEALEX

REG. U.S. PAT. OFF.

LINOLEUM FLOORS

Congoleum-Nairn Inc., manufacturer of Sealex Linoleums, is the largest manufacturer of smooth-surfaced floor-coverings in the world. Its products are regarded as the finest of their kind and are used in enormous quantities in schools, colleges, universities, hospitals, libraries and other public and private buildings.

Sealex Linoleums take their name from the exclusive Sealex Process, developed and perfected by our technical experts. One important effect of this unique method of manufacture is to penetrate the tiny, dirt-absorbing pores, giving to Sealex materials practical qualities never before possessed by linoleum.

Dirt cannot grind into Sealex floors as into ordinary linoleum. Greases and liquids cannot penetrate them. Even hot fats, fruit juices, ink, etc., can be easily removed without leaving damaging spots or stains. Cleaning is easily accomplished with a mop or push broom. Scraping, varnishing or refinishing are never necessary.

Sealex Linoleum and Sealex Treadlite Tile offer other practical virtues which make them ideal for school installation. These resilient, cork-composition materials provide insulation against sound, heat and cold. They are quiet and comfortable underfoot—shock-absorbing, noise-absorbing. They provide a smooth, sanitary, non-slippery surface which will not crack, chip or splinter.

As for wearing qualities, the durability of a Sealex floor is simply a matter of the thickness of the material used. Our heavier linoleums, installed in locations where traffic has been hard and constant, are still on the job, in good condition, after many years of service.

A distinctive floor of Sealex Treadlite Tile in the library of the Cossitt Avenue School, La Grange, Ill. Every Treadlite Tile floor is laid to order. Tiles are made in many different shapes and sizes and in a wide selection of plain and marbleized colors to harmonize with any decorative scheme.

Above is one of the many striking "ready-made" patterns available in Sealex Linoleums. Incidentally, this sanitary, easily cleaned material is an ideal floor for the school cafeteria. Picture taken in Huston Hall, University of Pennsylvania.

There are many types of Sealex floors specially suitable for school use. Just developed this year are the unique Veltones, entirely new effects in floor decoration. A Veltone floor is an unbroken flow of harmoniously blended colorings. There are no tiles, no disturbing color contrasts. Yet every square yard has its own individuality—little distinctive touches in the marking that are never repeated.

Other Sealex materials laid from rolls are the solid-colored Sealex Battleship Linoleum and duotone Sealex Jaspé Linoleum—heavy-duty floorings that have been used with conspicuous success in classrooms and corridors.

When special patterns are desired for the school library, assembly hall, restaurant or principal's office, we recommend Sealex Treadlite Tile. As the name suggests, these handsome floors are laid tile by tile in any design or color combination you choose. It is also possible to have your school shield or motto figure in any Sealex floor as an ornamental inset. Expert cutters at our factory cut out these Linsignia and ship them to your flooring contractor ready for installation.

Sealex floors may be installed in any building either as part of the original equipment or over the present wood, cement or stone floors. Write us for any information on the subject of school floors—no obligation, of course.

BONDED FLOORS are floors of Sealex Linoleum and Sealex Treadlite Tile, backed by a Guaranty Bond issued by U. S. Fidelity & Guaranty Company. They are installed by Authorized Contractors located in principal cities

SEALEX LINOLEUM
Stain-proof Easily Cleaned
SATISFACTION GUARANTEED OR YOUR MONEY BACK

Gymnasium floor of Sealex Battleship Linoleum in West Milwaukee High School, Milwaukee, Wis. Physical directors tell us that this resilient, non-splintering material makes "a safe floor to fall on"—practically eliminating the type of injury known as "floor burns."

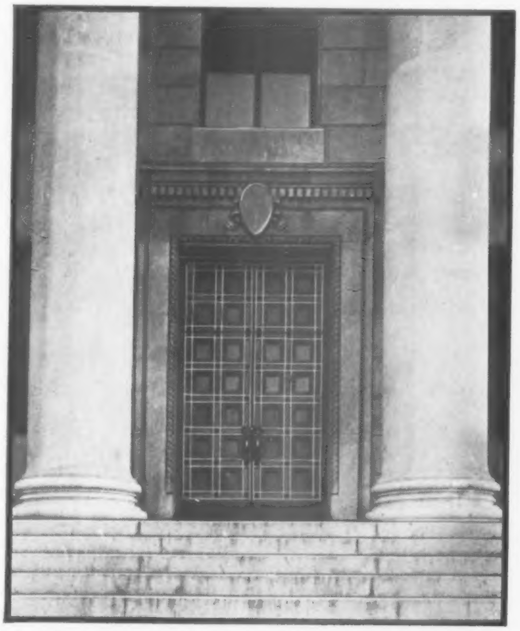
Sealex Jaspé Linoleum has an attractive two-toned graining which is very pleasing. Obtainable in a variety of colors, it adds cheer and "decoration" at no sacrifice of practical advantages. Classroom in the Regina High School, Norwood, Ohio.

DAHLSTROM HOLLOW METAL SMOKE SCREENS

In addition to the Hollow Metal Entrance and Swing Doors, Dahlstrom has perfected the Hollow Metal Smoke Screens for school construction.

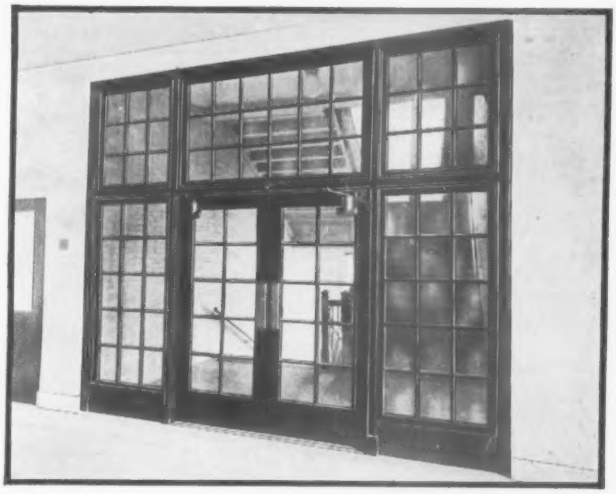
The vital importance of this fire protection unit in the modern school building is generally recognized. It is a source of pride that the development of this Hollow Metal Smoke Screen was made possible through Mr. Dahlstrom's patented hollow metal door design. The wide use of Dahlstrom Smoke Screens in modern school buildings reflects the appreciation of school architects of the part Dahlstrom played in making the Hollow Metal Smoke Screen possible. Since public interest in the welfare of school children is always present, particularly in regard to the proper protection against the fear of fire hazards, the first duty of any individual or group entrusted with the planning of school buildings should be to specify Hollow Metal Smoke Screens.

Since its inception, users have been highly enthusiastic about the beauty and simplicity of its appearance, and the practicability of its work as a firecheck. By guarding the stairways and corridor entrances, Dahlstrom Hollow Metal Smoke Screens confine the fire to its origin and prevent its spread from floor to floor. Illustrated below is a typical Dahlstrom Smoke Screen. For those who are interested, more detailed information and illustrations of recent installations are available. With the largest facilities in the world devoted exclusively to the manufacture of Hollow Metal Products, Dahlstrom invites your inquiry regarding Hollow Metal Entrances and Swing Doors, Elevator Entrances, Smoke Screen, Trim and Partition.



DAHLSTROM HOLLOW METAL ENTRANCE DOOR WAS INSTALLED IN THE BAKER CHEMICAL LABORATORY, ITHACA, N. Y.

"No building is more fireproof than its doors and trim."—Dahlstrom.



DAHLSTROM HOLLOW METAL SMOKE SCREEN SHOWN WAS INSTALLED IN THE COVENTRY SCHOOL, CLEVELAND, OHIO

"QUIET ZONE" FOLDING WALL

Construction

Consists of a series of wood frame sections, each from 4 to 6 feet wide. The upper and lower members of each section fold inwardly by a mechanism which keeps the side members vertical. On each side of the frame are an outer face of tautly stretched, well-nigh indestructible, special herringbone, closely woven, acoustical fabric, a layer of felt, and an inside sheet of smooth-polished enameled drill;—with a sound absorbing air space of 3½ inches between the faces.

The opposite faces of the wall are held in control at intermediate folding positions until each section is folded within its own width into cabinets protruding 12 per cent of opening.

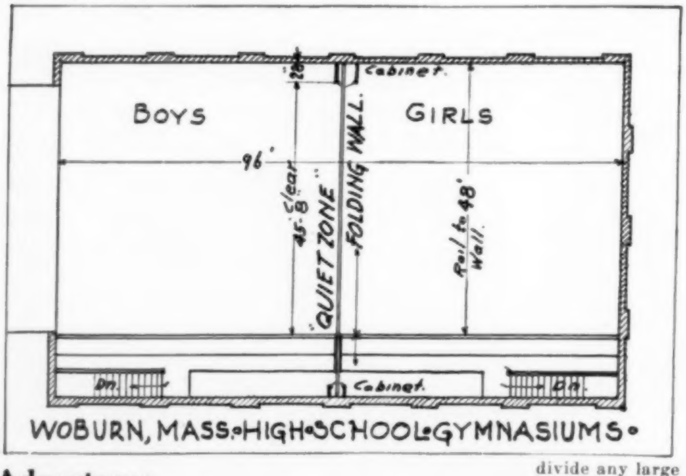
Cabinets may be provided as part of the building or will be furnished.

The frames are suspended at each vertical member on roller bearing trolleys running in a steel ceiling track.

SHOWS WALL DIVIDING GYMNASIUM
(Part extending over gallery)

Price per square foot does not increase with height and length. Endures indefinitely. Easily cleaned with wall paper cleaner, or soap and water.

Bolted connections **only** are used; and with malleable iron hinges, steel cantilever angles, and heavy sash chains operating over steel pulleys, they form a fool-proof mechanism which survives roughest "gymnasium usage." Floor bolts, operating automatically, hold the wall rigidly at each vertical member.



WOBURN, MASS. HIGH SCHOOL GYMNASIUMS.

Operation

To Extend—Simply pull out of cabinet and, if necessary, press down foot tread of each section.

The end section can easily be folded enough to make a passageway, or it may be hinged to provide a regular swinging door.

To Fold—Lift up foot tread of each section, beginning with section nearest cabinet, and push into cabinet. Large walls may be operated by cable arrangement, from point within cabinet.

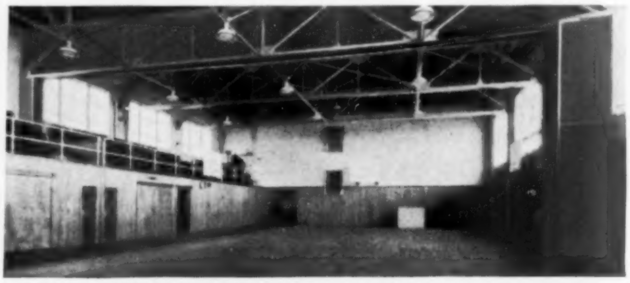
Use

To divide gymnasium of schools into boys' and girls' departments; to divide stage from assembly room; for class or gymnasium purposes. To form impromptu dressing rooms back stage by use of Model "B," which need not extend to ceiling. To divide any large room into quiet stalls or cubicals where individual work may be under observation.

Advantages

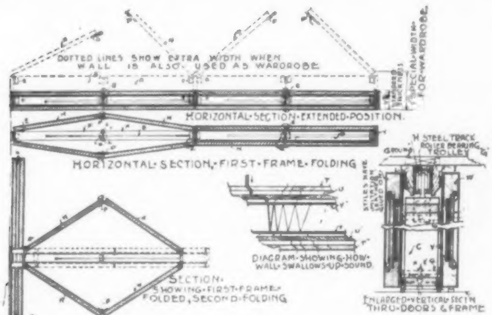
Acoustical—Cut down volume of sound at any given moment by absorption of sound waves, leaving a minimum of sound to pass through the folding wall. Because of relative arrangement of absorbing and reflecting surfaces, they subdue as much sound as a studded plastered wall.

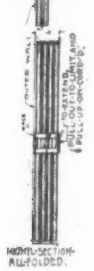
Mechanical—Easily, quickly and quietly operated regardless of size. No binding or shrinking. Only 4-inch width required in which to fold. No floor track or guide required, permitting rugs to run under.



SHOWS WALL FOLDED INTO CABINETS

"SILENT ZONE" FOLDING WALL



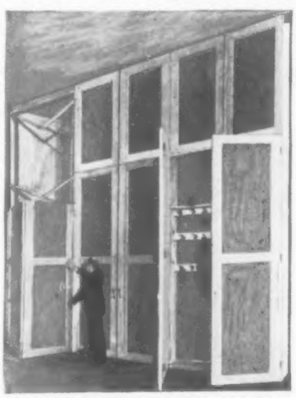


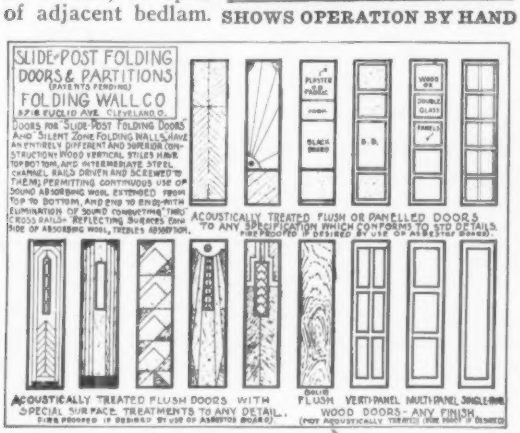
Consists of a series of wood frame sections similar to "Quiet Zone," substituting for the flexible covering on each side of the frame, a pair of doors, operating simultaneously with it, and having a similar dead air space between. This space with wider frames, becomes a wardrobe when pins of hinges between the doors are removed. Then each door becomes one of a pair to the wardrobe. **Illustration** shows near side upper doors removed in first section to show frame mechanism; also last section wardrobe doors open. Hook rails are folding.

Operated by winch in cabinet of adjacent wall.

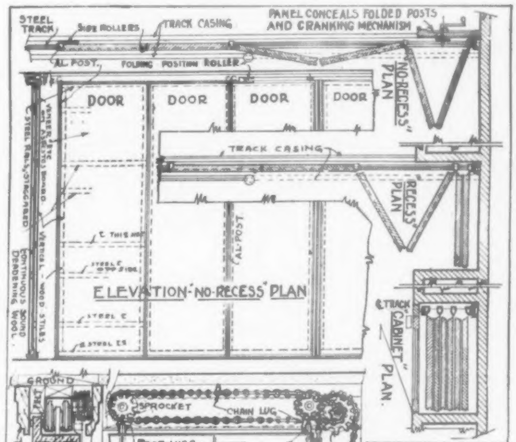
Advantages—Four times as soundproof as any so-called soundproof single door folding partition.

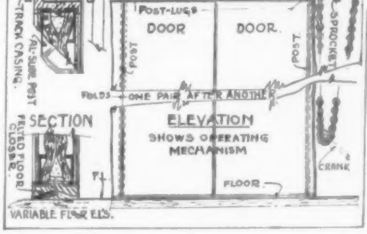
Use—To divide school rooms which are to be thrown together for assembly, from each other; or to divide other rooms where silence is wanted, in spite of adjacent bedlam.


SHOWS OPERATION BY HAND



"SLIDE-POST" FOLDING DOOR PARTITION

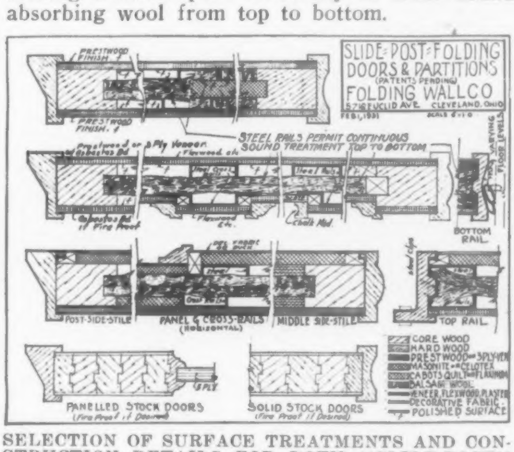




Aluminum Slide Posts, hung from overhead steel tracks by roller bearing trolleys, and with automatic floor bolts, have pairs of doors hinged between them in a manner that permits direct (non-swivel) folding-door operation of the easiest kind; and at the same time effects more complete closure.

Operated by short chain-drive mechanism, or by hand.

Advantages—No floor track; automatic floor bolts; light weight; continuous operation; tighter closure; less cost; and more soundproof because of special construction of steel channel cross rails on each side with space between permitting uninterrupted continuity of inner sound absorbing wool from top to bottom.



SELECTION OF SURFACE TREATMENTS AND CONSTRUCTION DETAILS FOR BOTH "SLIDE-POST" AND "SILENT ZONE" DOORS

GRAYBAR ELECTRIC COMPANY

Executive Office: Graybar Building, Lexington Ave. and 43rd Street
New York, N. Y.

GraybaR
ELECTRIC COMPANY

Akron, Ohio
Albany, N. Y.
Asheville, N. C.
Atlanta, Ga.
Baltimore, Md.
Beaumont, Texas
Birmingham, Ala.
Boston, Mass.
Brooklyn, N. Y.
Buffalo, N. Y.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Dallas, Texas
Davenport, Iowa
Dayton, Ohio
Denver, Colo.
Detroit, Mich.
Duluth, Minn.
Durham, N. C.
Flint, Mich.
Ft. Wayne, Ind.
Ft. Worth, Texas
Grand Rapids, Mich.
Hammond, Ind.
Harrisburg, Pa.
Hartford, Conn.
Houston, Texas
Indianapolis, Ind.
Jacksonville, Fla.
Kansas City, Mo.
Knoxville, Tenn.
Los Angeles, Calif.
Louisville, Ky.
Memphis, Tenn.
Miami, Fla.
Milwaukee, Wis.
Minneapolis, Minn.
Mt. Vernon, N. Y.
Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Newark, N. J.
Norfolk, Va.
Oakland, Calif.
Oklahoma City, Okla.
Omaha, Nebr.
Peoria, Ill.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Providence, R. I.
Reading, Pa.
Richmond, Va.
Roanoke, Va.
Rochester, N. Y.
St. Louis, Mo.
St. Paul, Minn.
Salt Lake City, Utah
San Antonio, Texas
San Francisco, Calif.
Savannah, Ga.
Seattle, Wash.
Spokane, Wash.
Syracuse, N. Y.
Tacoma, Wash.
Tampa, Fla.
Toledo, Ohio
Trenton, N. J.
Washington, D. C.
Wichita, Kan.
Worcester, Mass.
Youngstown, Ohio

Graybar Inter-Phones

The best practice in educational construction work recognizes the importance of a swift and dependable interior telephone system.

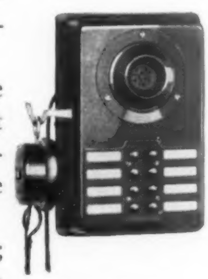
Leading architects engaged in planning new school and college buildings consider Inter-Phones an essential part of the design and equipment. School boards very definitely appreciate the importance of this telephone system that knits all the individuals of the teaching staff together—without, at the same time, requiring the services of an operator.

CRADLE HAND SET

Coupled with their extreme simplicity — the user merely pushes a button to make the desired connection — Graybar Inter-Phones are reliable in the extreme. Associated with them is over a half century of experience in the supplying of telephones and telephone equipment. In addition to this, the longest record of service in the field of sound transmission, are the high precision standards to which Graybar Inter-Phones are built and tested.

ITS RECORD

The most conclusive proof of the high quality of Graybar Inter-Phones is their performance in actual service. Inter-Phones have been installed in schools and colleges from coast to coast, rendering in every case satisfactory service.



WALL TYPE

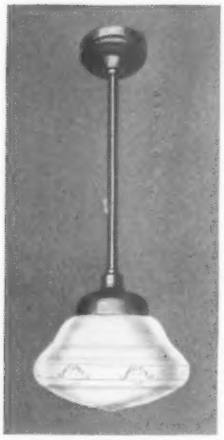
Inter-Phones are made in various styles to meet a wide variety of requirements. On this page are shown two such styles.

One is the wall type; the other is the cradle hand set type.

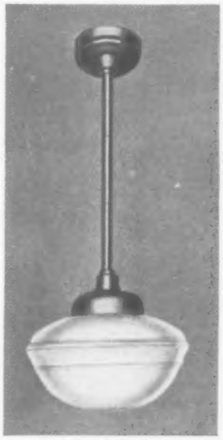
The selection of the proper type of Inter-Phone is considerably simplified by the large amount of information and experience records available. Graybar Inter-Phone specialists will be glad to place this material at the disposal of architects and school boards.

School and College Lighting Equipment

Adequate lighting with proper diffusion and without glare is a fundamental requirement for every school and college building. The Graybar Electric Company has given the problem of proper school lighting special study and has developed a line of lighting fixtures and glassware well suited to school and college needs.



THE SHELCREST "66" GLOBE, DECORATED



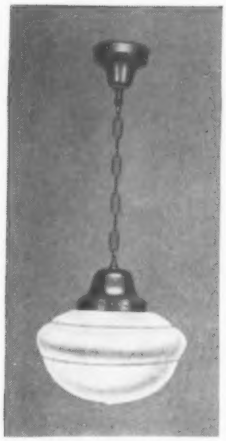
THE SHELCREST "33" GLOBE

Wide Choice of Equipment

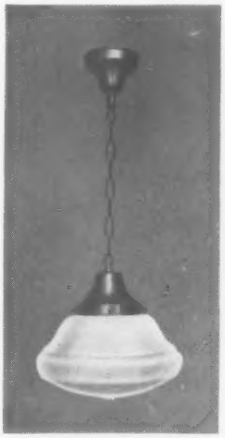
Graybar offers a wide choice in lighting fixtures of hanging or ceiling type with a variety of glassware for direct or semi-indirect lighting, either plain or decorated.

Special Designs Furnished

Although the designs shown on the page are all standard units, Graybar can supply specially planned fixtures for any lighting purpose to harmonize with the architectural surrounding of the building in which they are to be placed.



THE LINCREST "99" GLOBE



THE FAIRCREST "66" GLOBE

Outdoor Floodlighting Equipment

Graybar also has a complete choice of lighting equipment for ornamental lighting, floodlighting, athletic field lighting, etc. If your problem is better school lighting of any kind ask Graybar for full information. Graybar offices are located in 76 principal cities or write to Graybar Electric Company, Graybar Building, New York, N. Y.

LEONARD-ROOKE COMPANY, INC.

Elmwood Station
Providence, R. I.

Manufacturers of

Leonard Thermostatic Water Mixing Valves

Safety Features:

Leonard Valves are anti-scalding and anti-chilling, as they automatically shut off the hot water if the cold water fails and vice versa. The thermostat control is of the solid metal type which cannot be damaged by extreme temperatures in the hot water supply.

Uses:

They are used on showers, combination shower and tub, lavatories, X-ray developing tanks, also to control batteries of showers and lavatories, in schools, natatoriums, etc.

Finishes:

Nickel plate, chromium plate, natural finish (polished bronze), polished white metal castings, and in Duco colors.

Guarantee:

We take every precaution to obtain the best materials for the operating parts in Leonard Valves, namely, bronze and phosphor bronze, and will replace free of charge any parts found defective through faulty material or poor workmanship.

Write for Catalog C, our complete descriptive booklet.

TYPE L-9

TYPE L-9-E
(Exposed Piping)

Type L-9 Valves have a capacity of approximately 8 gallons per minute under 45 pounds pressure and are marked with a word scale: Cold, Tepid, Warm, Hot.

They can be furnished for either exposed or concealed piping.

All operating parts are assembled in the shell or front casting of the valve which makes cleaning or re-packing a very simple matter.

MODEL B

MODEL B-10

Model B Valves are adapted to either individual or battery control and are made in seven sizes ranging in capacity from 5 to 200 gallons of water per minute.

These are the only water mixing valves with a scale for predetermining temperatures by degrees. The scale regularly furnished is 80 to 120°, indicated every 10°. Special scales can be furnished on request.

Control of Temperatures to Showers in Battery Form:

The drawing below illustrates the method of temperature control to showers in battery form, with individual regulation of tempered water at each showerhead.

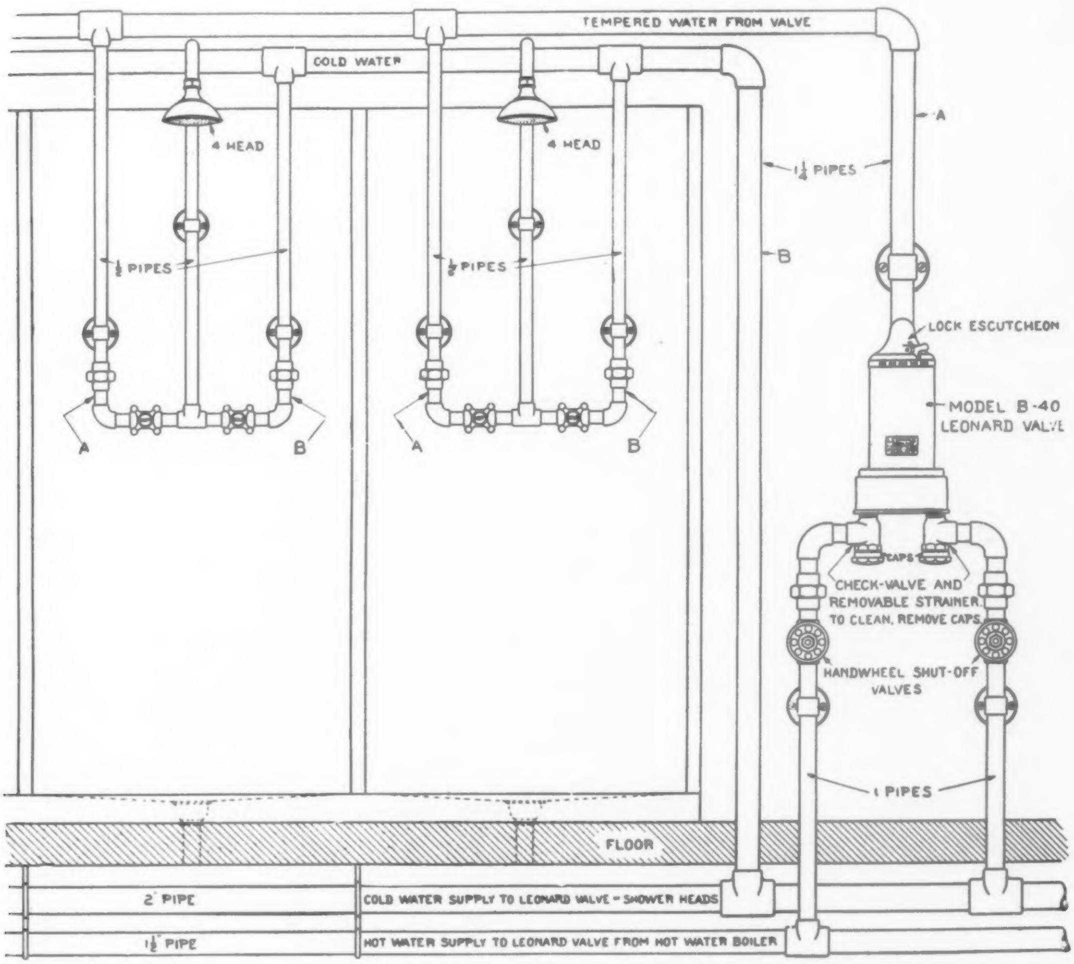
The pipe marked "A" carries tempered water and is connected to the outlet of the valve. It runs to the left-hand side of each shower connection. The pipe marked "B" is cold water supply which is connected to the right-hand side of each shower.

This system of temperature control prevents the bather from receiving excessive hot water as the Leonard Valve is set, in this instance, to deliver a temperature of 115 degrees. The valve may be set to deliver any temperature within the range marked on the valve.

For battery installation Lock Escutcheon for both Temperature and Volume control should be used, as it prevents bathers from changing the temperature or flow at which the valve is set.

Bathers are protected against scalding due to fluctuations in supply pressures caused by other fixtures in the battery being opened or closed.

This system of temperature control is particularly adapted for the control of showers in battery formation for public baths, schools, playgrounds, etc.



MODEL B-40 FOR BATTERY CONTROL

project usually designs a special bronze base and special stone work. We gladly offer our services to Architects by assisting them in properly designing the necessary foundation so that no damage may result from vibration, water or by the water freezing. Continuous Tapered Flagpoles, regardless of length, are usually shipped in one piece each, without field joints, but where shipping and handling will not permit the poles are shipped in two sections each and assembled at the erection site by means of a special field joint. This assembling, however, cannot be accomplished by inexperienced men and we will not ship Continuous Tapered poles in sections unless the assembling in the field is accomplished by our own men. This tends to enhance the cost slightly but insures the purchaser a first class installation which might be marred through the neglect and inexperience of others doing this work.

Further information regarding Continuous Tapered Flagpoles will be mailed to those interested upon application.

Installations

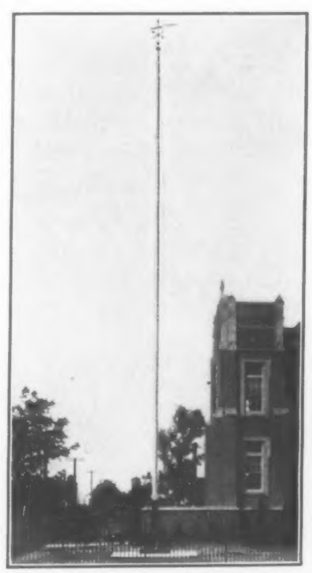
University of Kansas Stadium, Lawrence, Kansas
University of Michigan Museum, Ann Arbor, Michigan
University of North Carolina Stadium, Chapel Hill, N. C.
Mercersburg Academy, Mercersburg, Pa.
Font Bonne College, St. Louis, Mo.
Luther College Gymnasium, Decorah, Iowa
University of Rochester Hospital, Rochester, N. Y.
Concordia Teachers College, River Forest, Ill.
State Normal School, Salisbury, Md.
School of Mines, Rapid City, South Dakota
Philadelphia Public Schools (over 200 installations)

Catalog

Our 60-page General Catalog, containing full information, prices and specifications of Swaged Sectional and Continuous Tapered Flagpoles, gladly mailed upon request.

90 X 99-FT. HEAVY PATTERN SWAGED SECTIONAL FLAGPOLE

One of the 200 manufactured and erected for the Philadelphia School Board.



60-FT. ABOVE GRADE CONTINUOUS TAPERED POLE

7⅝-in. butt x 3½-in. top. Parochial School, Riverside, N. J.

80-FT. OVER-ALL CONTINUOUS TAPERED POLE

14-in. butt x 5-in. top. Massachusetts Mutual Life Insurance Building, Springfield, Mass.

THE NORTH ELECTRIC MANUFACTURING CO.

AUTOMATIC TELEPHONE EQUIPMENT

Galion, Ohio

Established 1884

Products

Private Automatic Telephone Systems for Schools, Colleges, Office Buildings, Industrial Plants, etc.

City Automanual Telephone Exchanges
City Dial-Automatic Telephone Systems
Remote-Controlled Telephone Exchanges
Remote-Control for Power Systems
Automatic Dials; Telephone Relays

Telephone Facilities in Schools

Present-day school construction and administration have created a need for rapid and reliable telephone service throughout the entire organization. In past years intercommunicating systems of the key-per-station type having a limited capacity have been used with no small degree of success. However, old-time methods are no longer adequate to meet present-day needs: the increased size of modern school buildings and their extensive business administration have outgrown the old-style intercommunicating systems both in size and utility.

Fortunately telephone development has kept abreast of the times, and an Automatic Telephone System is now available whose ease of installation, simplicity and economy of wiring, speed of operation, and uninterrupted service free from maintenance meet the many exacting requirements of present-day school telephone service exactly and economically.

The "All-Relay" Automatic Telephone System is this latest development in the telephone art. It is the result of many years of practical experience and intense study in the development of an Automatic System free from the repeated interruptions of service and constant skilled attention in maintenance required by the earlier types of Automatic Telephone Systems.

As its name implies, the "All-Relay" System is composed of a combination of telephone relays—one of the simplest of electrical devices. These relays are the acme of simplicity, having but a single moving member supported on a knife-edge bearing, operated by a direct application of force, with minimum latitude of motion, free from friction.

No Maintenance

The elimination, in the "All-Relay" System, of complicated mechanisms with their large latitudes of motion, their hammering actions, frictional operation and constant need of lubrication, has solved the maintenance problem and produced a system which, once installed, tested and placed in service will operate for months if not years at a time without routine maintenance attention. This claim, it is believed, cannot conscientiously be made for any other type of Automatic Telephone System.

Meets the Needs of All Schools

There is a North system to meet the needs, conditions and requirements of ANY school with adaptability for every requirement.

At the new Duke University plant, at Durham, N. C., a North "All-Relay" Automatic telephone system of ample capacity is serving the entire group of buildings.

At Harvard University, a 100-line North system was installed in the Mallinckrodt Chemistry Laboratory in 1928. The next year another North "All-Relay" system with 200-line capacity was installed in the new School of Law, Langdell Hall.

For schools where 10 to 50 phones are needed the North Simplex "All-Relay" Unit meets every need at very moderate cost. Common talking but selective ringing.

North Systems are serving scores of Schools and Colleges in all parts of the United States. They are thoroughly proved by service.

Automatic Service

The "All-Relay" Automatic Telephone System provides instant communication at all times. Principal, Faculty, Engineer or Janitor are always within the range of the Automatic Telephones or the ubiquitous call system.

Its automatic operation, incomparably faster than manual operation, eliminates those irksome moments of waiting and gives the satisfied assurance of reaching your party regardless of his or her whereabouts in the building.

The cost of manual operators is saved, because the Automatic System dispenses with operators—it is self-operating. Instant service is thus ensured morning, noon and night; no inattention, no delays, no misunderstandings.

Telephones

Automatic Telephone instruments with dials are used as illustrated. These are the highest grade standard telephone instruments as used in City Exchanges for long distance transmission.

Wiring

The most economical and efficient wiring scheme, consisting of a single pair of wires between each telephone instrument and the central exchange equipment, minimizes installation costs and permits additions and changes to be made at little expense.

Operation

In operation the "All-Relay" System is simple, rapid and practically noiseless.

To make a call simply lift the receiver and dial the required number — the exchange does the rest.

Ringing is instantaneous, intermittent and automatic; there are no keys or buttons at the telephones.

Each line is able to communicate with every other line.

Conversations are secret and guarded from interference except as otherwise provided for.

Access to a busy line is automatically prevented and a distinctive tone transmitted to the station attempting.

Secrecy or Supervision

The fact that the "All-Relay" System functions automatically without an operator, ensures absolute secrecy of conversations. If supervision is desired to safeguard against improper use of the system a Monitor Feature is furnished. Executive-Right-of-Way service can be furnished for a limited number of stations, giving the user absolute priority of service and access to all lines whether idle or busy.

Emergency

In case of FIRE or other EMERGENCY the Automatic System continues to render instant service under conditions in which human life is impossible.

Special Services—Capacities

Code call, emergency alarm, general conference feature, dial-less phones (teacher calls principal only), and other adaptations and special features together with an ample variety of Unit sizes enable North Systems to meet the requirements of all Schools.

Further information and names of Schools using North "All-Relay" Automatic Telephone Systems, will be supplied promptly without obligation.

PEERLESS UNIT VENTILATION CO., INC.

Pioneers in Unit Ventilation

Bridgeport, Connecticut

RESIDENT ENGINEERS IN PRINCIPAL CITIES FROM COAST TO COAST

PEERVENT UNIT SYSTEM

Of Heating and Ventilating

The PeerVent System of heating and ventilating consists of a series of units—usually one unit for each room to be served—which draw in fresh air from outdoors, heat it to any required temperature, and deliver it in such a way that perfect diffusion is obtained without drafts and without the slightest noise.

How It Operates

Fresh air is drawn in through an opening in the back of the unit, usually near the floor, by two multi-blade fans, which are operated by a small electric motor at comparatively slow speed. The outdoor air is driven upward by the fans through a special copper radiator. This radiator is so efficient that it will heat the incoming fresh air from a very low outdoor temperature to whatever degree is desirable for the particular room being served. The warmed fresh air passes out of the unit vertically through a grill at the top, at considerable velocity, and so directed that it is thoroughly diffused throughout the room. Seats placed close to a PeerVent are not uncomfortably warm, as they are when placed close to ordinary radiators. There are neither cold drafts nor blasts of too-warm air in any part of the room.

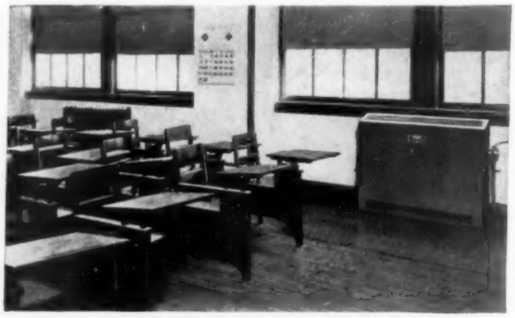
50 PeerVents Are Installed in the Floral Park-Bellrose School, Floral Park, Long Island

Temperature Control

Control of room temperature is secured by means of a mixing damper situated between the fans and the radiator. This damper can be adjusted forward and backward, under hand or automatic control, in such a way that the incoming cold air is either all passed through the radiator, or all by-passed around the radiator, or partly through and partly around it, the heated and unheated air being thoroughly mixed as the air leaves the unit. The mixing damper has nothing whatever to do with the volume of incoming fresh air. This volume is constant, as predetermined by the requirements of the room.

Recirculation

In order to heat an unoccupied room quickly after periods during which no steam has been supplied to the radiators, with the least possible expenditure of fuel and in the quickest possible time, it is possible to shut off entirely the flow of air from outdoors and to recirculate the air in the room. This is accomplished in the Peer-Vent by means of a single damper. The motor and fans need not be operated while the room is unoccupied, unless it is necessary to increase the temperature by means of recirculation.



A Typical Classroom Installation

Automatic Control

Automatic temperature control of the Peer-Vent Unit can be provided by means of a thermostat, which operates the mixing damper. Pneumatic control of the combination fresh-air and recirculation damper can also be provided, so that ventilation of each room in the building can be started and stopped from a central point in the basement or elsewhere.

The fresh-air damper also can be controlled automatically. A simple automatic device permits the machine to recirculate the air in the room when starting in the morning, until the room temperature reaches 65 degrees (or any other predetermined point within a range of 15 degrees). At this temperature the fresh-air intake damper will open automatically, thus stopping recirculation, and the machine will continue to deliver its rated volume of ventilation as long as the room temperature is normal. If the room temperature at any time should fall below 65 degrees, the fresh-air intake damper is closed automatically and remains closed until the temperature again reaches 65 degrees. This control is so designed that when the unit motor stops, the fresh-air intake damper is automati-

cally closed, making it impossible for cold air to enter the room through the unit during periods of vacancy or at other times when the unit motor is not running.

Advantages of the PeerVent System

Each PeerVent is entirely independent. The cost of running it depends upon actual service rendered in the one room which it serves, regardless of any other room in the building. The system has ample flexibility to meet changing weather conditions, changes in the direction and velocity of the wind, and other variable conditions.

Standard PeerVent Heating and Ventilating Unit

All expense for ventilating unoccupied rooms is eliminated. If one or a few rooms are needed after school hours, they can be heated and ventilated without waste. An open window in a single room cannot disrupt the entire heating and ventilating system throughout the building, as in the case of a central system.

Quiet operation has always been a characteristic of the PeerVent System. The latest Units have improved fans which can be run slower than formerly for a given volume of air. This and other improvements make the modern PeerVent absolutely silent in operation.

There are no bulky or complicated mechanisms in connection with the PeerVent System. The unit itself is extremely simple in construction, and there are no parts that are likely to wear and cause trouble in the course of long service.

The unit system requires no apparatus room in the basement, and no built-in or sheet-metal heat flues, thus saving much space for more advantageous uses or saving excavation if the additional floor space in the basement is not needed. Expensive ceiling construction is eliminated, permitting reduced story heights and enormous savings in the building construction costs. The unit system also eliminates heat duct losses.

The PeerVent System costs less to install and operate, as compared with a central fan system. It is easy to plan and lay out, and no special provision for ventilation need be made in the building design, excepting the small air inlet openings. The PeerVent System can also be installed in an old building, as readily as in a new one.

Various combinations of hand and automatic control are available. All dampers can be hand-operated, or all of them can be operated automatically, or combinations of hand and automatic control can be used.

Latest Improvements

All important unit features have been improved in the latest PeerVent machines, including the radiator, motor, fans, and controls. The radiator is especially well made, having unequaled thermal efficiency and the strength necessary to insure trouble-free service. The unit is remarkably compact—only 32 inches high and 14 inches deep, the width varying with the capacity of the unit.

All parts of the PeerVent are easily removable without tools.

PeerVent Unit with Front Removed, Showing Fans (1), Air Filter (2), and Peer Fin Radiator (3)

Service Backed by Experience

The Peerless Unit Ventilation Company was the pioneer manufacturer of heating and ventilating units. Peerless Units installed twenty years ago are still in service and giving perfect satisfaction.

A catalog will be sent on request. Detailed drawings of the units, and tables of engineering data, will be found in Sweet's Architectural Catalog. Any special information will gladly be furnished on request.

SPEAKMAN COMPANY

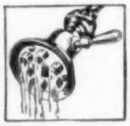
Wilmington, Delaware

The Speakman Company makes a complete line of showers and shower heads designed especially for schools, colleges, universities and institutions. In designing this equipment consideration has been given to water economy as well as cost of upkeep.

SHOWN here are three new types of shower heads. All embrace the Anystream Self-Cleaning principle (patented). There are six plungers which move through the face of these heads. In each plunger are eight tapered grooves which are set, either by the lever handle, a key or screwdriver as shown in the K-3397 and K-3396 heads.

The bather operates the lever handle of the K-3395 shower head — the other two are flushed at regular intervals by an attendant.

These shower heads will never stop up!



Flood Shower

K-3395 — Speakman Anystream Self-Cleaning Shower Head (Pat. Jan. 2, 1923)

Normal Shower

Needle Shower

Any volume or force from a flood shower to a needle bath now possible by setting the plungers in the new kind of a shower head

K-3397 — Speakman Anystream Self-Cleaning Shower Head with ½-inch I. P. female inlet and arranged to be operated with a screwdriver

K-3396 — Speakman Anystream Self-Cleaning Shower Head with ½-inch I. P. female inlet and lock-shield arranged to operate by a key

The heavy spindle shown in the open yoke has an eccentric motion which, as the handle is turned, pushes or pulls the plate to which the plungers are attached. The face of the head is held in place securely by three heavy set screws

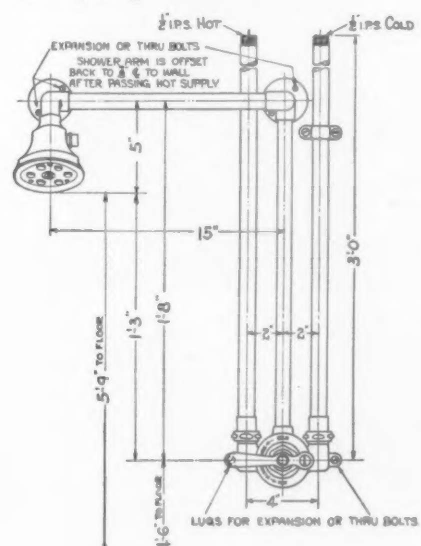
This 16-page bulletin should be in the hands of every one interested in any way in school showers. It contains authoritative information on showers and shower heads not available in any other place. Gladly sent upon request

Nothing will ever wear out in the new Anystream Self-Cleaning Shower Head

The cut-away view shows the sturdiness, also the operating principle of the Speakman Anystream Self-Cleaning Shower Head. The plungers are pulled or pushed through the face of the shower head when the handle is turned thus reducing or enlarging the size of openings through which the water passes.

Below is one of the newly designed Speakman School Showers

The piping in these showers is so close to the wall that it is impossible to get the fingers behind them. Several types of Speakman School Showers are illustrated in our new 16-page bulletin which will be sent to school boards, superintendents of schools, architects—any one interested in the use, installation and upkeep of showers.



K-3110—Exposed Mixometer Type, designed for institutions

THE STANDARD ELECTRIC TIME COMPANY

Springfield, Mass.

ATLANTA, William-Oliver Bldg.
BALTIMORE, Baltimore Trust Bldg.
BIRMINGHAM, 2920—7th Ave., So.
BOSTON, 10 High St.
BUFFALO, 220 Delaware Ave.
CHARLOTTE, 215 Latta Arcade
CHICAGO—Monadnock Bldg.
CLEVELAND—Union Trust Bldg.
COLUMBUS—83 South High St.
DALLAS, Mercantile Bldg.
DENVER, 562 Pennsylvania St.
DETROIT, Donovan Bldg.
KANSAS CITY, MO., Mutual Bldg.
MINNEAPOLIS, McKnight Bldg.
NEW YORK CITY, 50 Church St.
PHILADELPHIA, 1612 Market St.
PITTSBURGH, Bessemer Bldg.
SCRANTON, 148 Adams Ave.
TAMPA, 5505 Central Ave.

The Standard Electric Time Co. of California
950 Parker St., Berkeley
LOS ANGELES, 124 West 4th St.
PORTLAND, 65—1st St.
SAN FRANCISCO, 1 Drumm St.
SEATTLE, 1714 1st Ave., So.
SPOKANE, 110 S. Cedar St.

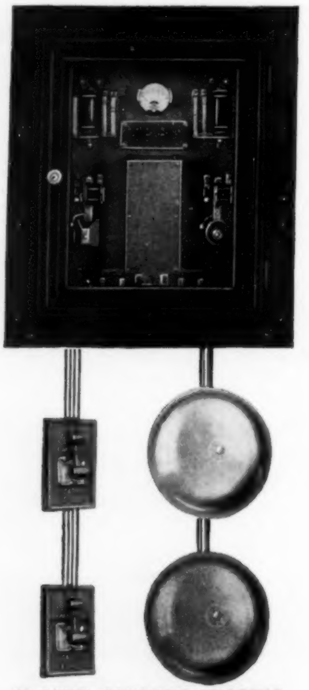
The Standard Electric Time Company of Can., Ltd.
726 St. Felix Street, Montreal

"STANDARD" Fire Alarm Systems

(Approved by Underwriters)

1. **Maximum Protection to Life and Property**
2. **Thorough Reliability**
3. **Simplicity**
4. **Economy in Operation and Maintenance Cost**

These are the qualifications which have made "Standard" fire alarm systems so successful everywhere and the choice of prominent architects, engineers and school officials.



CLOSED CIRCUIT SYSTEM

Closed Circuit Supervised Fire Alarm System

These systems are furnished to operate from either A.C. or D.C.; are single or double supervised as required. Fire signals are sounded on gongs or horns as desired, and sent from break-glass stations conveniently located throughout the building.

This system is as near fool proof as a fire alarm system can possibly be made,—the last word in school fire alarm equipment.

Station Coded System

These systems provide double code stations ringing distinctive signals from each box indicating location of fire and permitting safe exit.

Open Circuit System

In cases where our open circuit system is desired without the electrical supervision,

(TYPE 450) OPEN CIRCUIT SYSTEM

Type 450 is recommended. This operates similar to the closed circuit FBS system except for its open circuit and non-supervision features. Vibrating gongs are recommended as preferable with this type.

Write for Bulletins

See page 481 for laboratory equipment.

ELECTRIC TIME AND PROGRAM EQUIPMENT

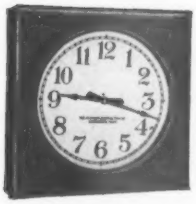


FIG. 116
SQUARE WOOD CASE SECONDARY CLOCK

Standard Electric Time products are the result of nearly half a century's experience in the manufacture and installation of school equipment. They are manufactured of the best materials obtainable, by skilled labor, under expert supervision, and are engineered and installed under a system which insures absolute satisfaction to the owner.

The "Standard" line of electric time equipment now comprises two distinct systems both of the minute impulse type. One is operated from battery—preferably storage battery type—the other the A.C. Constant Service type which operates from the A.C. lighting service with reserve power unit which functions instantaneously and automatically in case of current failure.

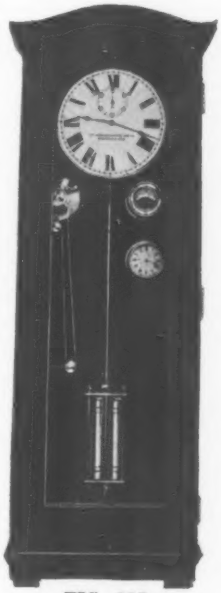


FIG. 105
MASTER CLOCK
60-BEAT MERCURIAL PENDULUM

The "Standard" program clock is completely automatic, ringing the bells on predetermined schedule with automatic silencing feature. Bells and yard gongs are furnished in various styles and sizes.

FIG. 803
PROGRAM BELL

Standard secondary clocks are furnished in wide variety of designs with wood or metal cases also special marble or metal dials according to requirements.

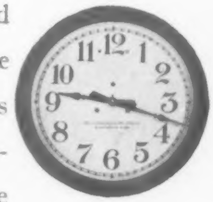


FIG. 118
ROUND METAL CASE SECONDARY CLOCK

Standard Electric Time Equipment has been the predominant choice of school boards and architects for many years, owing to its superior excellence and unquestioned reliability. "Standard" manufactures and furnishes all types of program bells.

School Telephone System

The "Standard" School Telephone system is combined with the bell control board and furnishes a selective ringing, common talking system of the utmost simplicity and reliability operating from the same current supply.

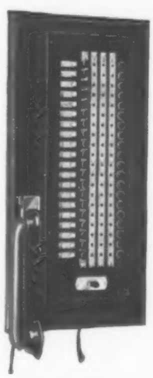
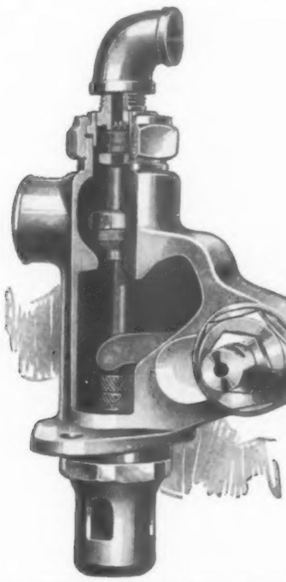


FIG. 818
COMBINATION BELL CONTROL BOARD AND CENTRAL TELEPHONE STATION

See page 472 for description of "Standard" laboratory systems.

Complete specifications, estimates and other data will be gladly furnished architects or other school officials upon request. Write Home Office or nearest branch.

FIG. 819
WALL TELEPHONE WITH WATCH-CASE RECEIVER



CUT-AWAY VIEW OF VALVE USED ON VOGEL NUMBER TEN AND TEN-A CLOSETS. HAS ALL WORKING PARTS OF HIGH-TENSION BRONZE. WILL NEVER WEAR OUT

Note the valve operates vertically, eliminating any tendency to drag which is frequently present in valves which operate horizontally.

However, we wanted proof for you of how good these closets really are; so we took a Vogel Number Ten outfit from stock and placed it on an Endurance Test. This test began on July 16, 1929, and by an automatic arrangement the closet has flushed night and day continuously—302,450 times without even a washer being renewed, more than a hundred years of use—and the test continues indefinitely.

This test proves conclusively that Vogel Number Ten and Ten-A closets have three qualities essential to school closets:

1. Ability to withstand continued hard usage
2. They seldom need repairs or adjustments
3. They will flush freely on three to four gallons of water—saving at least one gallon on every flush

Vogel Number Ten and Ten-A closets are not only durable but good looking as well. With the Number Ten the tank is exposed, and with the Ten-A it is concealed behind the wall. They can be supplied with syphon action or syphon jet bowl and hard rubber composition seats can be furnished if desired. Juvenile height bowl can be supplied.

There is no complicated piping in Vogel closets and once installed they require no further attention. The only repair ever necessary is a washer which may have to be renewed after years of use. ***Children cannot forget to flush Vogel seat-action closets.***

We have prepared a comprehensive booklet designed especially for school boards, architects and engineers, which tells you many things you should know before you install closets in your school. No matter what type of closet you intend to purchase this booklet contains much information which will be of value to you. A copy will be sent promptly upon request.

BULLETIN DESIGNED ESPECIALLY FOR ARCHITECTS AND SCHOOL BOARDS, SHOWING COMPLETE DETAILS OF VARIOUS TYPES OF VOGEL CLOSETS, TOGETHER WITH ROUGHING IN MEASUREMENTS

Sent upon request

WESTINGHOUSE ELECTRIC AND MFG. CO.

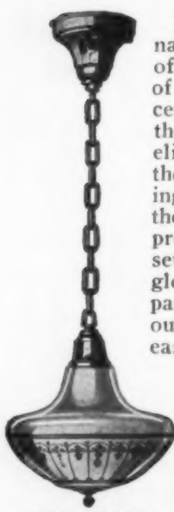
EAST PITTSBURGH, PENNA.

Sales Offices and locations in more than 110 cities throughout the United States

INTERIOR LIGHTING EQUIPMENT

The Westinghouse Electric & Manufacturing Company manufactures lighting equipment suitable for providing the proper distribution of light, free of glare and objectionable shadows, in any installation that is required in the educational institutions. In class rooms, laboratories, shops, offices, libraries and dormitory rooms, correct lighting should be provided.

FOR CLASS ROOMS, LIBRARIES, OFFICES AND DORMITORIES



SUSPENSION TYPE SOLLUX WITH PANELED HANGER AND DECORATED GLOBE

The Westinghouse **Sollux** Luminaire provides the highest quality of illumination. The globe contour of the Sollux utilizes the highest percentage of the light generated and the diffusing quality of the glass eliminates all glare. In the Sollux, the keeper ring method of supporting the globe in the hanger makes the globe totally enclosed and dustproof. It also eliminates unsightly set-screws and does away with globe breakage, due to unequal expansion and contraction. The tilt-out cap, another feature, permits easy replacement of the lamp without removing the globe from its holder.

Sollux is available with ornamental, paneled and plain hangers in both ceiling, chain suspension and semi-rigid types. Globes are plain and decorated, in sizes from 10 to 18 inches to accommodate lamps for 75 to 500 watts.

The Westinghouse **Sollaire** has practically the same efficiency of light distribution as the Sollux which it resembles greatly in appearance.

Certain Sollux features have been eliminated in the Sollaire and a considerable reduction in cost has thus been made possible.

CEILING TYPE SOLLAIRE WITH PLAIN GLOBE

The Sollaire comes with plain and paneled hangers for the ceiling type and with chain and semi-rigid hangers for the suspension type. Plain and decorated globes are available in sizes from 8 to 20 inches in diameter for lamps of from 50 to 1000 watts.

The Westinghouse **Sollite** offers a more angular globe for those to whom the Sollux and Sollaire globes do not appeal or who wish to use a globe with decoration in the more modern style. The Sollite comes in the plain, banded and **art moderne** styles. The diffusing glass used in the globe is of the same efficiency and quality as that used in Sollux and Sollaire Luminaires.

The simplified mechanical construction of the Sollite allows it to be offered at a lower price and the improved globe holder furnishes a quicker means of attaching and removing the globe.

CEILING TYPE SOLLITE

The Sollite is available in ceiling and suspension types with globes from 8 to 20 inches in diameter for lamps of from 50 to 1000 watts capacity.

Listed in the Commercial Lighting Catalog 219-B.

FOR LABORATORIES

For laboratories and for any other installations, where there may be corrosive fumes, the chromium-plated Sollux hanger should be used. These hangers are similar in construction to the semi-rigid Sollux, with the exception that they are chromium plated. Chromium plating provides a permanent bright finish and is not subject to corrosion.

Listed in Commercial Lighting Catalog 219-B.

FOR LABORATORIES AND SHOPS

For foundry, laboratories and similar installations in engineering schools, Westinghouse improved vapor-proof units are suitable. They consist of cast-iron hoods, housing front-connected sockets, vapor-proof glass globes and suitable reflectors. They are easy to install and assure an installation that is positively unaffected by vapor and corrosive fumes.

GLASSTEEL DIFFUSER

For general lighting in manual-training shops, gymnasiums, pools, and similar installations, the Westinghouse line of Glassteel Diffusers and industrial reflectors assure a most satisfactory lighting installation.

Glassteel diffusers absolutely eliminate glare under all conditions.

Deep bowl reflectors provide an intensified light upon the part of the working plane beneath it and for that reason are ideal fixtures for places where the requirements are such that strong local lighting must be provided.

DEEP BOWL FIXTURE

Listed in Industrial Lighting Catalog 219-A.

AN ATHLETIC FIELD LIGHTED BY CHROMILITE FLOODLIGHTS

OUTDOOR LIGHTING EQUIPMENT

Westinghouse Chromilite Floodlighting Equipment is most suitable for lighting large outdoor areas, stadiums, athletic fields, and for the floodlighting of buildings and monuments. These Westinghouse projectors are of cast aluminum, spun aluminum and spun copper, equipped with chromium-plated or silverglass reflectors. The reflector surface is impervious to corrosion or tarnishing, and is easily cleaned. Six sizes of Floodlights are available having 10, 12, 14, 16, 20 and 24-inch diameters, for lamp sizes from 100 to 2000 watts.

Aqualux underwater projectors, in addition to transforming the ordinary swimming pool into an object of outstanding beauty, permit its more general use at night with even greater facility than in daytime.

Equipment listed in Floodlighting Catalog 218-FB.

THE ILLUMINATING ENGINEERING BUREAU

Westinghouse maintains this Bureau to give advice and help in planning correct lighting, yours for the asking. Requests can be made at any Westinghouse Agent-Jobber or District Office.

For Commercial Cooking, see pages 404, 405.

PANELBOARDS

NOFUZE PANELBOARD

Westinghouse manufactures a complete line of panelboards to meet all lighting control applications.

The Type NAB Nofuze is equipped with circuit-breakers in the branch circuits in place of the conventional toggle switch and fuse. This new panelboard has many superior features such as: No fuses to change. Anyone can reclose the breaker and restore service as easily as a wall switch can be thrown. The circuit-breaker is tamper-proof as nothing can block its action or alter its operating characteristics. Circuit-breakers can be obtained in 15, 20, 25 and 30-ampere capacities and are interchangeable.

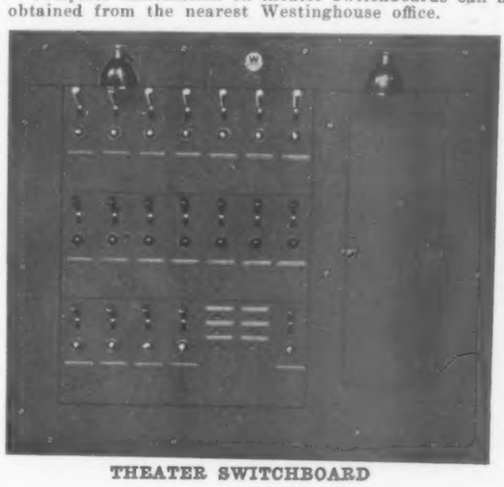
ST and NST panelboards, equipped with fuses and switches in the branches, and 2P and N2P panelboards with fuse protection only are also available.

Complete information on the entire line of Westinghouse panelboards is given in Panelboard Catalog 224.

Theater Switchboards

Westinghouse builds seven types of theater switchboards to meet the varied needs for control of colored lighting effects. Light, properly controlled, can add much to the effectiveness of the play or act. The audience, under the influence of colored light, unconsciously absorbs the spirit behind the production.

Complete information on theater switchboards can be obtained from the nearest Westinghouse office.



THEATER SWITCHBOARD

ALBERENE STONE COMPANY

Quarriers and Fabricators of Alberene Stone

Main Office: 153 West 23rd Street, New York

Quarries and Mills at Schuyler, Va.

BRANCHES

Boston, Newark, N. J., Philadelphia, Richmond, Va., Rochester, Pittsburgh, Cleveland, Chicago, Washington, D. C.

Products **(See also page 140)**

Alberene Stone, a natural quarried stone, fabricated for the following laboratory purposes:

- Table Tops and Backs
- Reagent Shelving
- Fume Hoods
- Sinks and Drainboards
- Baths and Tanks
- Acid and Chemical Storage
- Acid-proof Flooring and Base
- Pegboards
- Gutters

Physical and Chemical Properties

Alberene is a natural quarried stone, blue-gray in color, dense and non-stratified, chemically inert, impervious and non-staining, highly resistant to acid, alkali, flame and fire, non-absorbent and easily cleanable. It is easily machined—tongued, grooved, bored, drilled, slotted or turned—without splitting or spalling.

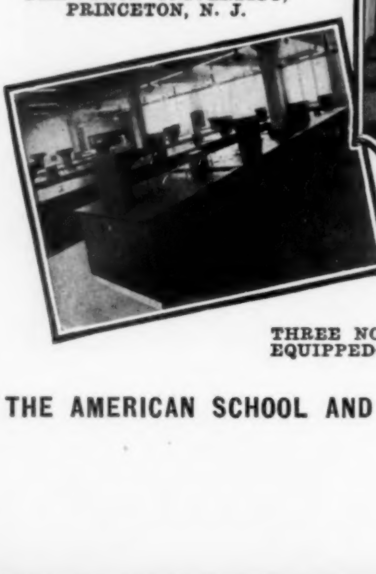
Method of Construction

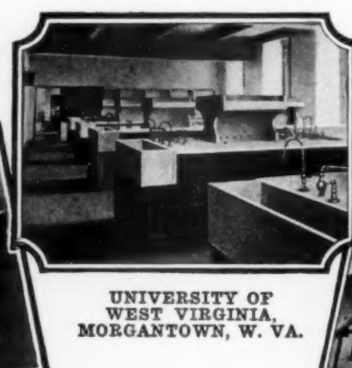
Alberene Stone laboratory fixtures are built by methods possible with no other stone. They are practically one-piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corroding metal cemented in grooves, with abutting edges of the slab ground and sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented. Such joints are permanently gas-and-liquid-tight.

Service in Design and Installation

Every laboratory of major importance equipped in the past 30 years has used Alberene Stone wholly or in large part. Out of this large experience the Company offers an advisory service, freely available to school and university authorities and architects.

FRICK CHEMICAL LABORATORY PRINCETON UNIVERSITY, PRINCETON, N. J.





UNIVERSITY OF WEST VIRGINIA, MORGANTOWN, W. VA.

BAKER CHEMISTRY LABORATORY CORNELL UNIVERSITY, ITHACA, N. Y.

THREE NOTABLE EDUCATIONAL LABORATORIES EQUIPPED THROUGHOUT WITH ALBERENE STONE

AMERICAN ABRASIVE METALS CO.

FERALUN—BRONZALUN—ALUMALUN—NICALUN

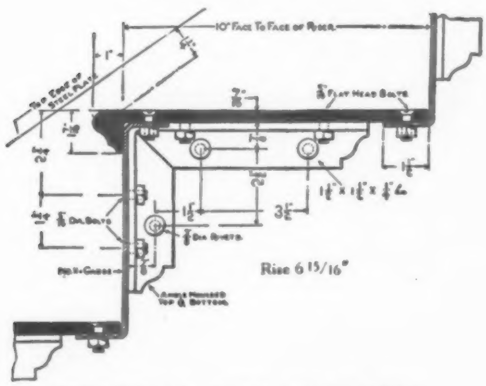
Names Reg. U. S. Pat. Off.

50 Church Street, New York City

BRANCH OFFICES

BUFFALO, Erie County Bank Building
BOSTON, 10 High Street
PHILADELPHIA, 1700 Walnut Street
PITTSBURGH, Farmers Bank Building
CHICAGO, 111 W. Washington Street
SAN FRANCISCO, 444 Market Street

FERALUN
Anti-Slip Treads

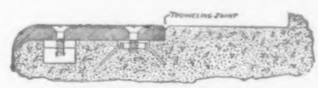


STRUCTURAL STYLE "S" SECTION

FERALUN ANTI-SLIP TREADS—STYLE "S" ON STEEL STAIRS

FOR NEW SCHOOL BUILDINGS—STYLE "S"

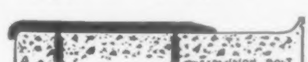
Style "S" Feralun Anti-Slip Tread, shown at left, especially designed for the New York City Board of Education, is now being specified by architects and school boards all over the United States. If concrete stairs are specified use Style "A" mentioned below. During the year 1930, 440 schools in 42 states have been equipped with Feralun treads. Such nationwide acceptance speaks for itself. This anti-slip product has proved its value in schools on account of its safety and durability.



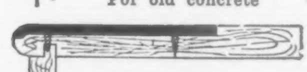
STYLE "A"
With metal anchors for new concrete steps

FOR REPAIR OF WORN STEPS—STYLE "A"

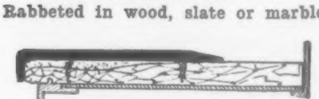
Style "A" Feralun Anti-Slip Tread is especially adapted for the repair of worn steps of any material. The cost of such repair work is small, and the Feralun treads are never slippery even when wet or covered with soapy or oily liquids.



STYLE "A"
For old concrete



STYLE "A"
Rabbeted in wood, slate or marble



STYLE "A" LONG LIP
For worn steps

AMERICAN BLUE STONE COMPANY

Producers of

AMBLUCO

Reg. U. S. Pat. Off.

NON-SLIP BLUE STONE

STAIR TREADS, LANDINGS, SADDLES AND FLOORING

SALES AND CONSULTING OFFICES	QUARRIES AND MILLS
101 Park Ave., New York	Ambluco, Wyoming Co., N. Y.

Reg. U. S. Pat. Off.

Products

The AMBLUCO Non - Slip Products are milled from a natural quarried gray blue sand stone and are:

AMBLUCO Non - Slip Stair Treads
AMBLUCO Non-Slip Stair Landings
AMBLUCO Non-Slip Door Saddles
AMBLUCO Non-Slip Floor Joiner Strips
AMBLUCO Non-Slip Swimming Pool Coping
AMBLUCO Stair Tread Risers
AMBLUCO Wall Base and Plinths

AMBLUCO Non-Slip Stair Treads

These treads have established themselves wholly on their own merits, with practically no introduction on our part. Down through the ages, they have held alone the title of the Proved Super Stair Tread.

Durable, Non-Slip, Maintenance-Free, Sanitary, Quiet, Fire-Resisting, Substantially-Attractive and Economical—the essential tread qualities—are each found in the AMBLUCO Treads to a superlative degree.

Durable

They outlast the life of a school and are at least 300% more durable than other natural stone and artificial treads.

Non-Slip

The 70% fine hard silica evenly distributed through the stone by nature produces a permanently uniform non-slip surface not possessed by any other tread.

Maintenance-Free

The first cost is the last cost. Never any need for resurfacing, resetting, tightening or replacing.

AMBLUCO NON-SLIP TREADS
Columbia High School
South Orange, N. J.
Guilbert & Betelle, Architects

Sanitary

No grooves or pores to collect filth and disease germs and do not produce dust, features necessary to the health of pupils.

Quiet

AMBLUCO Treads do not resound from footsteps nor become loose and rattle.

Fire-Resisting

Their heat-resisting quality makes them of great value in fire emergencies.

Substantially-Attractive

These treads of two-inch standardized thickness are furnished at the same cost as thinner ones and give a most substantial installation.

Economical

With the lowest ultimate cost and a low initial cost the economy of the AMBLUCO Treads have the outstanding record of nearly half a century of service and yet never a replacement necessary.

The more thoroughly one investigates, the more pre-eminently AMBLUCO stands out as the peer of all stair treads.

Whatever you have heard about stair treads, and wherever you have heard it, you have never heard anything but praise for AMBLUCO.

Ambluco Non-Slip Saddles

AMBLUCO Non-Slip Interior Door Saddles have all the same qualifications and are correspondingly of equal value as the AMBLUCO Treads.

Specifications

AIA22H specification catalog sent on application to architects and engineers who desire to incorporate in their specifications and have in their buildings the best stair tread on the market.

THE DETROIT STEEL PRODUCTS COMPANY

2250 East Grand Boulevard, Detroit, Michigan

FACTORIES: Detroit, Michigan, Cleveland, Ohio, and Oakland, California

Fenestra

STEEL WINDOWS FOR ALL SCHOOL BUILDINGS

For class rooms, auditoriums, administration buildings, Fenestra "Fenmark" Windows have numerous advantages: Frames and sash of heavier, solid steel sections that do not warp, swell, shrink, stick or rattle. Fire resisting. Afford increased light, thus minimizing eyestrain; natural ventilation without draft, thus increasing health, efficiency. Upper swing leaves open out casement fashion, or swing out at bottom while sliding down from top. Easily washed from inside the building. Lower leaf tilts in, acting as a wind guard at sill. Ornamental solid bronze hardware.

Screens easily attached where required. Wide variety of standard types and sizes sufficient for all ordinary building needs. Any amount of clear opening provided up to 100 per cent. Complies with all building code requirements and accepted ratio of window area to floor area as established for schools.

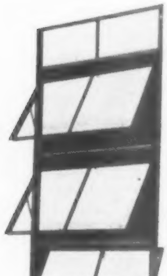
For gymnasiums, laboratories, locker rooms, swimming pools, power houses, and other subsidiary buildings, Fenestra horizontally pivoted or projected windows are desirable. Ventilators either manually or mechanically operated, singly, in banks or in tiers.

Self-locking cam handles. Can be arranged to open entirely outside the building to accommodate shades. Operation easily controlled from centrally located operating points. Fire hazards minimized. Insurance premiums reduced. Small glass lights permit easy and economical replacement when broken.

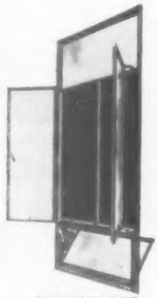
Fenestra Engineers gladly discuss daylighting and "airation" problems, assist with window layouts, provide estimates on alternate types.

Fenestra erection force erect and install all windows where desired, insure satisfactory installation and efficient operation. A complete service.

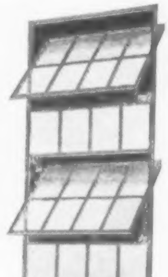
Fenestra Holorib steel roof decks, insulated, are light, durable, economical. Shed summer heat. Save winter fuel. An ideal base for felts, tile, slate or other roofing material. Quickly laid in any weather. Applicable to any type or pitch of roof. Frequently used as floor forms and for stadiums.



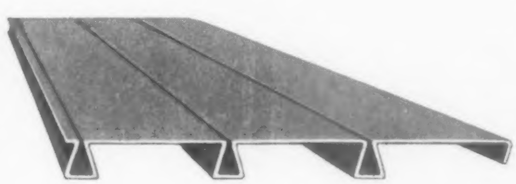
FENMARK PROJECTED



FENMARK WINDOWS



PIVOTED WINDOWS



Complete Specifications and Details in Sweet's Architectural Catalog

E. I. DU PONT DE NEMOURS & CO., INC.

Newburgh, N. Y.

DU PONT TONTINE

(Pronounced *Ton-teen*)

THE *WASHABLE* WINDOW SHADE

The Great Neck Senior and Junior High School, Great Neck, Long Island. Equipped Throughout with "Tontine" Washable Window Shades

Here are four reasons why schools and universities the country over insist upon equipping buildings only with New and Improved du Pont TONTINE window shades:

1. THEY ARE WASHABLE—Soap and water instantly remove dirt and soil without harming the material in the least.
2. THEY ARE WEAR-DEFYING—Because they are made with the same basic substance as the famous du Pont Duco, they do not fray, crack or pinhole. Sunlight does not fade them. Rain does not spot or stain them.
3. THEY ARE GOOD LOOKING—TONTINE window shades come in attractive colors and designs. Their original beauty is lasting, for these shades will be hanging long after ordinary window shades have been discarded.
4. THEY ARE ECONOMICAL—The New and Improved TONTINE shades deal kindly with the replacement budget because they last so long and so well. The initial cost may be a bit higher, but in the long run you will find it is economy to use them.

You can prove all that we claim for TONTINE shades by making a test in your buildings. For complete window shade satisfaction, have them mounted on TONTINE guaranteed rollers. Write to us for further information, samples, and a list of names of leading schools and colleges that are now using du Pont TONTINE.

DU PONT MURALART

THE *WASHABLE* FABRIC WALL COVERING

Du Pont Muralart is a new washable fabric wall covering which is rapidly gaining favor with leading architects, decorators and large building owners throughout the country. It has these outstanding advantages:

Its surface is of the same basic material as that used in du Pont Duco—hence its beauty and finish are lasting.

It is washable and waterproof—repeated washings with soap and water serve to keep it clean and will not harm it.

It can also be washed down without injury with a 5 per cent solution of carbolic acid, Dakin's solution, Lysol, or any other well-known disinfectant.

It is extremely resistant to scuffing and rubbing.

It is easily applied by an interior craftsman—and with no muss or inconvenience.

Because of its strong fabric base it bridges old cracks and acts as a surface support.

Du Pont Muralart has character because it is obtainable in a wide variety of interesting textures and colors.

Upon request we shall be pleased to forward to interested architects and school men sample book containing twenty-four colors.

THE DURAFLEX COMPANY

Baltimore, Maryland

NATIONAL REPRESENTATION

"DURAFLEX" PATTERN FLOORING

In classrooms and corridors Duraflex Pattern Flooring combines the wear of highways with pleasing colors, excellent appearance, smoothness, warmth, quiet, resilience and low cost. It is impervious, does not absorb water, and dirt on the surface remains there until removed. It is easiest to clean and keep clean. It resists fire, acids and alkalies.

Duraflex Pattern Flooring is a tile material one-eighth of an inch or three-sixteenths of an inch thick, made of a special highly refined asphalt combined with asbestos and color materials, in standard colors of tan, green, red, brown, gray and black, and in standard sizes of 9" x 9" and 12" x 12". Pleasing combinations can be obtained with these colors.

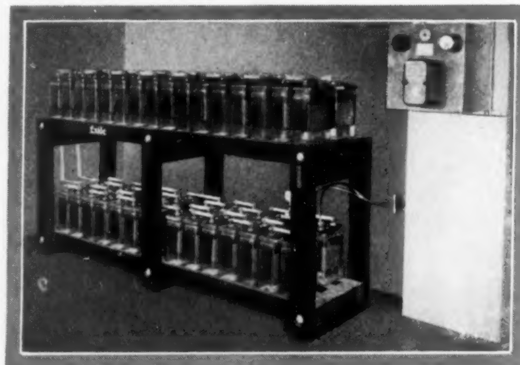
Duraflex Pattern Floring can be laid over cement or wood floors. The surface must be smooth, sound and solid. It is exceedingly advantageous in schools, hospitals, offices, basements, stores, etc.

THE ELECTRIC STORAGE BATTERY CO.

World's Largest Manufacturers of Storage Batteries for Every Purpose

Allegheny Avenue and Nineteenth Street, Philadelphia

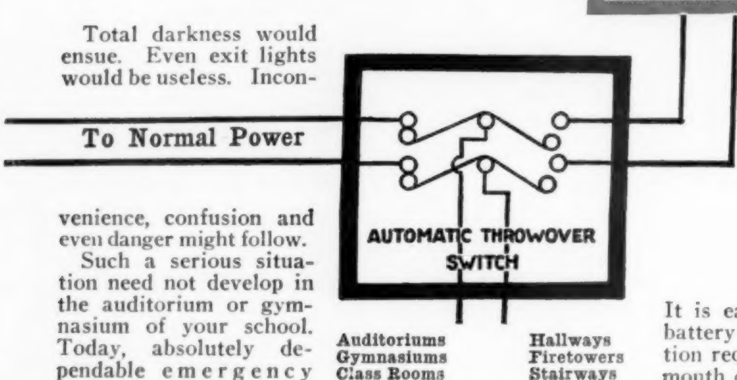
BRANCHES IN 17 CITIES THROUGHOUT THE UNITED STATES



FOR SAFETY . . . EMERGENCY LIGHTING

Your auditorium or gymnasium is crowded with pupils at lectures, plays, sports, or dances. What would happen if lighting current should suddenly fail?

Total darkness would ensue. Even exit lights would be useless. Inconvenience, confusion and even danger might follow.



Such a serious situation need not develop in the auditorium or gymnasium of your school. Today, absolutely dependable emergency lighting protection, which is automatic and instantaneous in its operation, is available to you in the form of an Exide Emergency Lighting System.

SIMPLE, EASY OPERATION

The Exide Emergency Lighting System—which consists of Exide Batteries and reliable devices to automatically control and charge the battery—is not complicated. The operation of this system is absolutely dependable. Furthermore, it is self-sustaining since it automatically and instantaneously furnishes the needed electric current during the full emergency period without a hand touching a switch, and because it automatically recharges the battery after the emergency discharge.

MEETS BUDGET APPROPRIATIONS

Exide Emergency Lighting Equipment comes in a wide range of sizes to suit the particular needs of your school and its budget appropriation.

Exide

EMERGENCY LIGHTING BATTERY SYSTEMS

It is easy to install, requires no separate battery room, and practically all the attention required is the addition of water every month or two.

DEPENDABILITY OF EXIDES

Behind every Exide Battery is over forty-two years of experience building dependable batteries for every purpose. This experience assures you of the following important features for an emergency lighting battery in school service:—absolute dependability, long life, freedom from care or trouble, moderate first cost and low operating and maintenance cost. Behind every automatic Exide control panel is the experience which the Exide Engineering staff has gained in providing similar control devices, particularly for central station emergency lighting and control bus service for the past twenty odd years.

SERVICE

Since each Emergency Lighting installation presents its own problems, The Electric Storage Battery Company maintains trained engineers in each of its 17 nation-wide branches, who will gladly assist you in planning installation.

For detailed information on the Exide Emergency Lighting System write for Bulletins. No obligation.

Dependable Exide Laboratory Batteries Available in Any Size

GLEASON-TIEBOUT GLASS COMPANY

CELESTIALITE "NEXT-TO-DAYLIGHT"

Registered and Patented

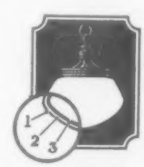
200 Fifth Avenue
New York City

LIBRARY OF THE NEW PHYSICS BUILDING, COLUMBIA UNIVERSITY

No light is too good for students. Many adults today suffer from eye-strain that is the result of the inadequate lighting under which they studied. Schools and universities are aware of their responsibility to safeguard students' eyesight by seeing to it that proper lighting conditions are supplied in classrooms, lecture halls and laboratories. That is why educators, when they select lighting equipment, naturally select equipment that will minimize glare; that will be restful to the eyes; that will most nearly produce a day-like effect.

The authorities in a number of our largest schools and universities have taken infinite pains in the selection of lighting equipment. After careful tests of various types of lighting systems, they have selected Celestialite, the "Next-to-Daylight" lighting glass. Because of its three-layer construction (one of which layers is blue), Celestialite lighting glass provides a clear, soft, day-like lighting effect. You can look directly at Celestialite without hurting your eyes. Under its soft rays students study better, teachers work more effectively, morale is raised, good health is promoted, and general progress increased.

Such colleges and universities as Wesleyan, Princeton, Virginia, Pennsylvania, College of City of New York, Stevens Institute of Technology, Rensselaer Polytechnic Institute, Amherst and many others have installed Celestialite after making the most careful scientific tests of its merits. We shall be pleased to send to any interested school authority a fragment of Celestialite glass showing its three-layer construction, and further information about the correct type of lighting for auditoriums, classrooms, lecture halls, and laboratories.



Celestialite's three-layer construction is the reason for its superiority. 1—a layer of crystal clear transparency—for body and strength; 2—a layer of white glass to diffuse the rays and soften the light, and 3—a layer of blue glass to whiten and improve the quality of the light.

INTERSTATE SHADE CLOTH CO.

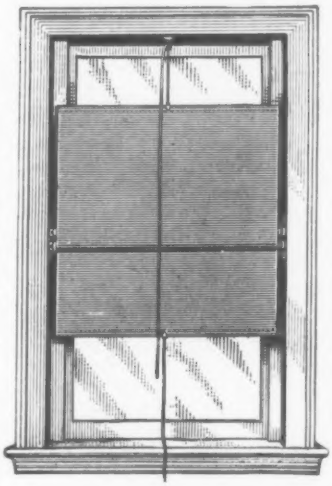
Hoboken, New Jersey

THE LAPSLEY-INTERSTATE SHADE CLOTH CO.,

Baltimore, Maryland

Double-Hung Window Shade Installation

Two window shades are installed at center of window. One shade may be pulled up to cover upper sash, the other shade pulled down to cover lower sash. Double-hung window shade installation is especially suitable for schools, since it permits control of light and ventilation.



"Inter-Twill" — The Long Wearing Shade Cloth

An improved type of shade cloth with the strength in the twill. We believe it is the toughest and strongest shade cloth and will outwear them all. It will stand abuse and rough usage. The threads will not "burn" when exposed to the sun's rays. It has special Interstate protective coating which makes it easily cleanable, reversible and long wearing. Soil is easily removed from its surface. The manner in which the twill fabric is woven insures the extra years of service. It is pure finished, and unfilled, no clay or other fillings used in the manufacture. Made in any color tone and in any combination of colors.

To darken auditorium—if total exclusion of light is desired, specify "LITE-PROOF" Shade Cloth. Shadowless and light-proof in all colors including light colors and white.

Also: Silver Screens for motion pictures.

INTER-TWILL

WINDOW SHADES

WILL OUTWEAR THEM ALL

THE STRENGTH IS IN THE TWILL

JOHNS-MANVILLE

292 Madison Avenue, New York, N. Y.

NEW YORK CHICAGO CLEVELAND SAN FRANCISCO NEW ORLEANS TORONTO

Acoustical Treatment

There are two classes of acoustical correction for schools and universities. The first requirement is that of auditoriums and large class rooms where it is desirable to have the words of speaker or teacher distinctly audible in every seat; or where music may be presented without causing disturbing echoes or reverberations.

The second class of correction is required for reducing noise to an undisturbing level in halls, corridors, study halls, gymnasiums, swimming pools, restaurants and kitchens. Science has proved by conclusive tests the advantages of quiet for study and, conversely, the injurious effect on the nervous system that results from constant exposure to noisy surroundings. This means that acoustical treatment is really a **health** measure.

Johns-Manville pioneered in the development of the science of sound control and have a large staff of acoustical experts available for consultation either on proposed buildings or existing school or college structures.

J-M ACOUSTICAL TREATMENT APPLIED TO THE ASSEMBLY HALL OF JOHN HAY HIGH SCHOOL, CLEVELAND, OHIO

There is a wide range of J-M sound control materials adaptable to the needs of any kind of room. They can be applied over any present wall or ceiling surface and lend themselves readily to any desired decorative scheme.

Bonded Built-Up Roofs

The construction of most school and college buildings is admirably suited to the protection afforded by a J-M Built-Up Roof. These Roofs are constructed of alternate layers of asbestos felts and asphalt with smooth or gravel surfaces.

THE TILDEN HIGH SCHOOL, BROOKLYN, PROTECTED BY A J-M BUILT-UP ROOF

There are more than 20 types of J-M Roofs to select from. These roofs are applied only by trained roofing firms selected by Johns-Manville for skill and integrity. They are known as J-M Approved Roofers.

All worry and care about leaks, fire and upkeep is removed for a specified term of years. Depending on the grade of roof selected, a bond backed by Johns-Manville and the National Surety Company will be issued to the purchaser —for 10, 15, or 20 years.

Tile Flooring

In halls, corridors, lobbies, vestibules, lavatories, restaurants, gymnasiums, laboratories, locker rooms, or wherever there is heavy traffic, J-M Tile Flooring Type A is specially recommended.

These tiles are long-wearing, resilient, comfortable, stain-proof, fire-resistant, of pleasing appearance and low in cost. They are furnished in a variety of colors and patterns that provide floors adapted to every need in educational buildings.

KERNER INCINERATOR COMPANY

3701 North Richards Street

Milwaukee, Wisconsin

OFFICES AND AGENCIES IN OVER 150 CITIES

Products

The Kernerator Incinerators for the prompt, safe and sanitary disposal of garbage and rubbish of all kinds by burning, without cost. Made in three types

Flue-fed type
Basement-fed type
Estate (downdraft) type

with various sizes and layouts to fit the need of any city, county, or district school, high school, college, university, or school dormitories—planned, building or existing.

Importance of the Kernerator for All Types of School Buildings

It has become the constant purpose of the school board members, the school superintendent, the architect and the builder—all those responsible for school design and construction—to make certain equipment is provided that will promote safe and sanitary conditions in the school building.

KERNER SILENT DOOR

Silent Doors

A gentle impulse will close the KERNERATOR receiving hopper door. The slight metallic clang of the door can be stilled by another exclusive KERNERATOR feature—the silent door. This is equipped with a device which eliminates unnecessary noise, a desirable feature in school installations.

Kernerator Operation

No gas, coal, or other commercial fuel is required under ordinary circumstances. Waste of all kinds, including sweepings, waste paper, tin cans, broken crockery, bottles and garbage (if any) are placed in the hopper doors, conveniently located on each floor. This refuse falls down the flue, into the incinerator combustion chamber. There it spreads out on the grates into a separated and loose pile. This permits the constant flow of air up through the by-pass flue, circulating through and around it, causing a considerable amount of air-drying between burnings.

When the incinerator is nearly full, the refuse is lighted from the top—a match does it. Due to the by-pass flue, the combustion is from the top downward, unburned gases passing through the flames destroying unpleasant odors. The fire feeds upon the waste paper and other dry combustible material; gradually drying the damp substances so that they also are reduced to ashes.

After several burnings, the ashes, along with cans, bottles and other non-combustibles (which are thoroughly flame sterilized), are dumped into the ash-pit for removal every few months.

Safety

There are probably no buildings in which the immediate and sanitary disposal of waste is as important as in schools. Statistics show a large percentage of fires are due to accumulations of loose waste paper and rubbish in school basements. Baling paper is a doubtful economy.

Panics

With fire-resistant construction, there is not much chance of **Material** damage. Smoke and fire are apt to produce **Panics** and panics are as perilous as fires. When a crowd of human beings is intent on escape from real or fancied peril, each one is an entity, with every faculty or power bent on self-preservation. If one falls, he has not only lost himself, but becomes a stumblingblock to those who follow, with the result that the loss of life and limb far exceeds the physical damage from the fire.

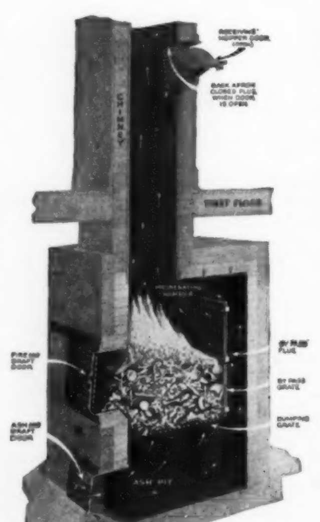
The proportionate cost of KERNERATOR equipment is very low. By eliminating the necessity for daily collections of loose waste paper and accumulations of this material in school basements, it provides a definite insurance against panic losses.

Sanitation and Hygiene

The KERNERATOR provides a convenient, sanitary and economical method for handling all sweepings, lunch remains, garbage from the cafeteria (if there is one) and all promiscuous waste.

There is no denying the fact that the sanitary waste from girls' wash rooms is a constant source of maintenance expense for the cleaning out of clogged drains and damage from flooded toilets. This occurs in spite of receptacles placed in the washrooms.

Flues may be so located that one set of hopper doors will open into the girls' washrooms. This idea has been adopted by a number of architects (names upon request) with very satisfactory results in actual operation.



SECTIONAL VIEW SHOWING INTERIOR AND OPERATION OF KERNERATOR

Notice the draft reaching the point of burning through the by-pass grate. The fire is always on top of the burning material, consuming offensive odors.

Economy

The KERNERATOR eliminates the expense of labor, time and equipment in handling, storing and transporting rubbish and garbage; the necessity of daily collections of waste paper and sweepings—frequent trucking. It also cuts the cost of plumbing repairs due to drains stopped by sanitary waste in girls' washrooms.

Service

The KERNERATOR is made and sold by the pioneer in the flue-fed incineration field. It is guaranteed for the life of the building, and this guarantee is backed by a financially sound organization having a stable, trained corps of incinerator experts with a wide experience in school installations.

Further Information

When you are making plans for a school building, may we send a specialist to discuss your waste disposal problems? He will be glad to recommend the proper type and size of equipment depending upon the number of rooms, number of pupils, and the height of the building.

Literature

Send for "The School Problem of Waste Disposal" giving full information, and a list of KERNERATOR installations in over 300 schools.

Specific data for Architects in Sweet's Architectural Catalog

THE POWERS REGULATOR COMPANY

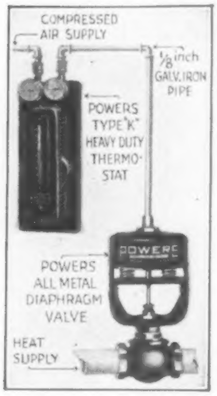
40 Years of Specialization in Temperature Control

2724 Greenview Avenue
Chicago

OFFICES IN 41 CITIES
See your phone directory

231 E. 46th Street
New York

Automatic Temperature Control for Heating and Ventilating Systems



The Powers Pneumatic System of Temperature and Humidity Control for heating and ventilating systems will give the biggest return on heat control. The Powers Vapor Disc Thermostat and All-Metal Valve often cost more, but are worth more—because of the following reasons:

(1) They often give 15 to 20 years of Accurate and Dependable Control without repairs of any kind.

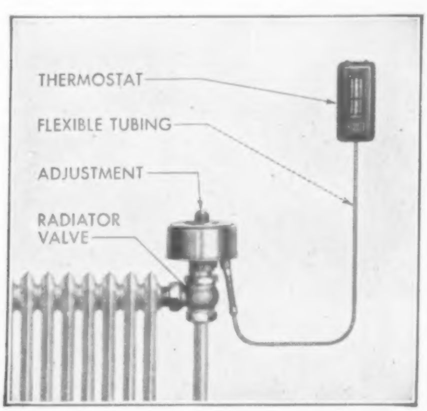
(2) Greater Steam Economy owing to the fact that thermostats do not get out of adjustment and permit overheating.

(3) Greater Comfort and Health of occupants of rooms—temperature is neither too hot nor too cold—but just right.

(4) A minimum of Service Calls and the trouble and annoyance connected with them.

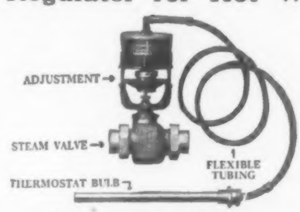
Write for Estimate. Let one of our engineers study your particular requirements and submit an estimate of the cost of installing Powers Temperature Control. There is no obligation.

The Powers Thermostatic Radiator Valve. This self-contained thermostatic radiator valve will control the temperatures of classrooms, shops, corridors, etc., heated by direct radiation of vapor or vacuum heating systems. Requires no compressed air—is easy to install and affords an economical means of applying temperature control to heating systems already in operation. It also is particularly adapted to control cabinet heaters and concealed radiation.



Write for Bulletin No. 260 which shows many different types of installations, dimensions, prices, etc.

Regulator for Hot Water Heaters



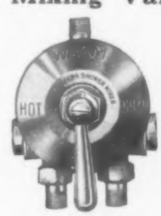
NO. 11 REGULATOR

The Powers No. 11 Tank Regulator for steam-heated hot water service. Will pay for itself many times in steam savings. Self-contained—requires no compressed air—is easy to install. Accurate and dependable.

The Powers No. 10 Regulator for accurate regulation of large storage and instantaneous hot water heaters, swimming pools, drinking water systems, etc. Can be operated by either compressed air or water pressure.

Write for Bulletin No. 2035 for complete details and prices of these regulators.

Mixing Valves for Showers



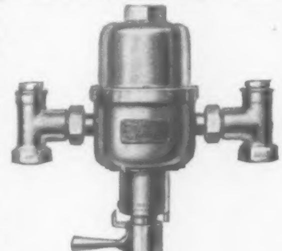
SHOWER MIXER

The Power Safety Shower Mixer absolutely prevents scalding caused by failure of cold water or pressure fluctuations in supply lines due to use of nearby fixtures. No sudden "shots" of hot or cold water. Maximum delivery temperature can be limited by Safety Stop.

Write for 22-page book describing this remarkable mixer.

The Powers Thermostatic Water Controller for group showers, gang showers, laundry wash wheels, etc. Will mix hot and cold water in quantities up to 100 gallons per minute and deliver at any temperature desired. Has fewer parts than any other thermostatic water mixer and is positively scaldproof.

Write for 16-page book for complete description.



CONTROLLER

PURO SANITARY DRINKING FOUNTAIN CO.

HAYDENVILLE, MASS.

PURO

Nozzles above line of overflow of bowl.

Nozzles fully protected by a guarded hood.

Self-contained and automatic self-cleaning filters built in fountains.

Automatic stream regulators.

Volume regulators and self-closing valves.

FIGURE 14

A hundred combinations and designs for your every requirement.

New forty-eight-page catalog just filled with information that you should have.

SAMSON ELECTRIC COMPANY

Interior Telephone and Fire Alarm Systems

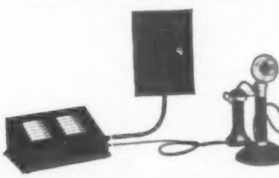
Principal Offices: Canton, Mass.

DISTRICT SALES OFFICES

BUFFALO, N. Y., 942 Elmwood Avenue
CHICAGO, ILL., 9 South Clinton Street
CLEVELAND, OHIO, 3133 Carnegie Ave.
DETROIT, MICH., 526 Detroit Savings Bank Bldg.
INDIANAPOLIS, IND., 31 East Georgia Street
LOS ANGELES, CAL., 324 North San Pedro Street
MINNEAPOLIS, MINN., 232 South Fourth Street
NEW ORLEANS, LA., 1812 Masonic Temple
NEW YORK, N. Y., 369 Lexington Avenue
PHILADELPHIA, PA., 1207 Race Street
PITTSBURGH, PA., 207 Fulton Bldg.
SALT LAKE CITY, UTAH, 4 Interurban Bldg.
SAN FRANCISCO, CAL., 274 Brannan Street
SEATTLE, WASH., 248 Central Bldg.

EXPORT: U. S. ELECTRIC EXPORT CORP., 15 Moore St., New York, N. Y.

TELEPHONE SYSTEMS FOR SCHOOLS AND UNIVERSITIES



CENTRAL STATION

Efficiency in modern education requires instant and reliable communication between members of the supervisory staff. For more than thirty years the Samson Electric Company has specialized in the design and manufacture of telephone equipment for schools. Such installations have been and are giving dependable and economic service in large numbers of educational institutions throughout the United States.

ANNUNCIATOR

For small and medium size schools the most satisfactory service is provided by the central station type common talking system. The central station can selectively ring and talk with any outlying station, and any outlying station can ring and talk with central station. The outlying stations can ring and talk with each other by first calling central station. All calls to central station are registered on the annunciator drops and are reset electrically from the central station push-button block.

OUTLYING STATION

The Outlying Station is an attractive, most substantially constructed flush type all metal dust-proof telephone. It is equipped with transmitter mounted on adjustable arm for people of different heights and fitted with metal mouthpiece, dust-proof hook switch, metal back receiver with safety chain attached to cord and switch hook, and our standard buzzer.

For large schools and institutions we supply the selective talking lamp type switchboard system which requires the part time service of an operator. Literature or information will be promptly supplied on request.

FIRE ALARM SYSTEMS

BREAK GLASS BOX

It is universally recognized that dependable fire signal systems are necessary for school protection.

The dependability and suitability of Samson systems result from expert engineering and years of field experience. These systems are standardized for convenient specification by architect, ease of installation by contractor, and certainty of satisfactory operation by school authorities.

Closed circuit supervised systems offering various services, operating from the city's service or storage batteries, are found in the Samson line.

MASTER CODE BOX

The equipment shown illustrates the different units which comprise the Catalog No. 211 system. In this system the breaking of a glass in a signal station trips a master code box which operates a general alarm repeating a predetermined code six times upon single stroke gongs. Trouble of any kind is indicated by the continuous ringing of a special-toned vibrating bell.

SINGLE STROKE GONG

Some of the Samson systems provide double electrical supervision by supervising both operating and supervising sources of power. Catalog and complete information will be promptly sent on request.

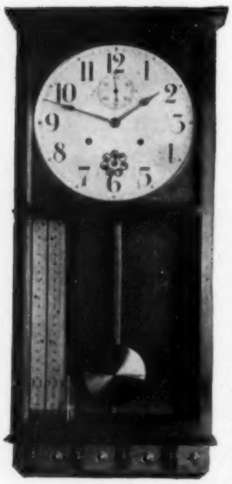
See page 363 for "PAM" Reproducing Systems.

CONTROL PANEL

TROUBLE BELL

THE MURPHY-DAVIS SIGNAL CO.

Topeka, Kansas



$150 F. O. B. FACTORY
Install it yourself.
It requires no servicing

MANUFACTURERS OF

MURDA

Program Clocks for Schools

Program Clocks

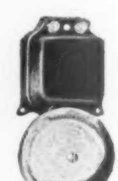
Our program clock is a simple unassuming hand - wound mechanism, the marked dependability of which is an invaluable feature in small schools. Built upon an 80-beat Seth Thomas movement, it will operate the bells automatically on four separate circuits, silencing them at night and on Saturday and Sunday.

With barely six years of history, the Murda has an enviable record, unapproached by any other program device. Every user is a booster. Service charges are unknown.

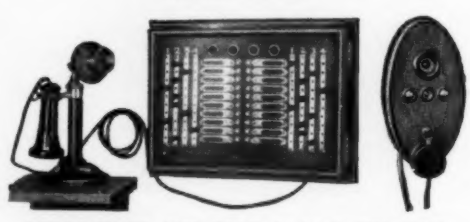
There is hardly a chance for failure of operation. No need for automatic self-regulating features, because time and program are permanently synchronized through single-unit mechanical operation. Designed to fill an urgent need for trouble-free operation outside of large cities where experts are not readily available, but equally efficient in large schools and groups of buildings. Because of its uniformly satisfactory performance this type of program clock will never become obsolete.

Secondary Clocks, Signal Equipment

The finest and most thoroughly dependable secondary clock system obtainable regardless of price. Operated independently of the program clock. Instead of one impulse each minute there is a steady imperceptible movement of the hands in the natural manner. **Each clock has a separate electrically wound movement** operating independently of all other clocks, but corrected hourly by the master clock. 110 volt A. C. is used throughout. One outstanding advantage lies in the fact that these clocks are not affected by temporary interruptions in the current supply. An interruption of several hours would cause no measurable variation among the secondary clocks. Even complete failure of the master clock for weeks at a time would cause less than a minute of variation among secondaries. All secondaries carry reserve power and no corrective devices are needed to provide against current interruptions. The chances of perfect operation are thus multiplied, and the services of a factory expert are very seldom needed, even in the installation of the system. Architects and engineers are rapidly coming to recognize the correctness of our principles of operation, and are turning to our specifications.



A Grouping of the Most Advanced Specialty Items from Five Reputable Manufacturers



TELEPHONE AND FIRE ALARM SYSTEMS

THE OLIVER C. STEELE MFG. CO.

Spiceland, Indiana, U. S. A.

Steele's Duck Shades

Steele's Duck Shades are manufactured—not merely assembled—in our own modern plant, by expert workers who know they must meet our exacting standards. Cordage, pulleys, brackets and rollers are all manufactured by us. In consequence, the cordage is heavier and more durable than ordinary cordage; the pulleys are stronger, easier-acting and longer-wearing than the usual stock pulleys; brackets are stronger than stock brackets; and our metal rollers give better service and longer life than any wood rollers. Our unbreakable metal slats contrast with delicate white pine.

Advantages

In serving their two-fold purpose of regulating sunlight and ventilation, Steele's Duck Shades offer many advantages:

DURABILITY—They are made to wear and give long service.

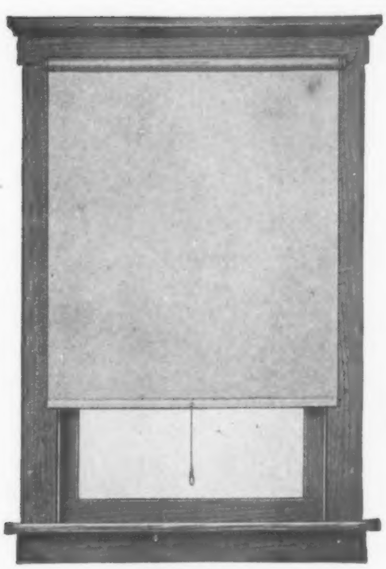
ADAPTABILITY—There is a wide variety of styles and sizes, so there is one for every purpose.

EASE OF OPERATION—They are quickly and easily adjustable to changing conditions of light and air.

BEAUTY—They are designed to please the eye, as well as to give long years of satisfactory service. The tan color (by far the most popular) harmonizes with any surroundings.

Write for Catalog No. 8

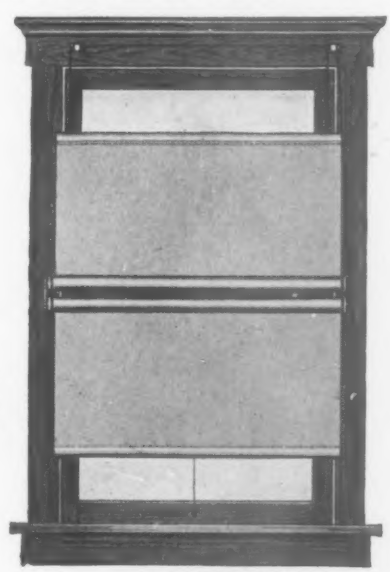
LIGHT STRIP WITH BRACKETS ATTACHED FOR DOUBLECORD SHADE



B BASIC

Steele's Duck Shades Equipped with Steele's Metal Rollers and Metal Slats

All our shades may have either inside or outside installation.



G DOUBLECORD

THE THOMAS-SMITH COMPANY

CANTON, OHIO

BRANCHES IN PRINCIPAL CITIES

Electrically and Mechanically Operated Fire Alarm Systems Electric Bells and Signals

PRODUCTS

Manually Operated Fire Alarm Systems.

Electrical and Mechanical Operated Fire Alarm Systems.

Enclosed Type Vibrating Bells for Direct Current or Alternating Current.

Combination Electrical and Mechanical Bells, Aluminum Grids.

FIRE ALARM SYSTEMS

The Thomas-Smith Alarm System for Schools and buildings is approved by architects and conforms with state codes.

MANUALLY OPERATED FIRE ALARM SYSTEM

The Thomas - Smith Fire Alarm System is the only one with rigid rod connecting the alarms of the different floors of the building.

The supports are adjustable to take care of uneven walls or misalignment of succeeding floors.

The floor tube is adjustable to allow for floors of various thickness and extends up from floor to prevent rod from being bent.

Spring is totally enclosed and positive in action.

All supports and tubes are bushed with brass.

Enamel baked on. Red, Black or Buff finish.

The best bells made.

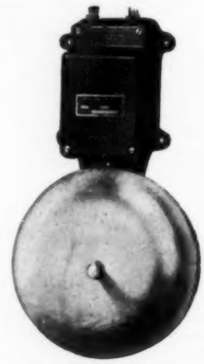
Handles of polished brass lacquered.

Operating rods of steel tube with chain stem properly proportioned and balanced.

Wood mats supplied for under supports and gongs.

Manufactured in both manually operated system and combination electrically and mechanically operated system which differ only in the method of operation.

Write for catalog and price list.



NOS. 6 JR. AND 6 D. C. AND NOS. 7 JR. AND 7 A. C. VIBRATING BELLS

THOMAS-SMITH LIBERTY BELLS

Thomas - Smith Liberty Bells cover all types and sizes from 3 inch to 20 inch, vibrating or single stroke, 110 volt, 220 volt, all standard transformer voltages, battery operation, direct or alternating current. Weatherproofed types furnished if desired at small additional cost.

All Thomas-Smith Liberty Bells embody the very finest of workmanship and materials and are approved by the National Board of Fire Underwriters.

Liberty Vibrating Bells are of the plunger hammer type. The No. 6-Jr. D. C. and No. 7-Jr. A. C. are made in 3", 4", 5" and 6" sizes and the No. 6 D. C. and No. 7 A. C. in 6", 8", 10", 12" and 14" sizes.

The No. 12 A. C. and No. 11 D. C. Enclosed Type Single Stroke Liberty Bells are made in 5" 6", 8", 10", 12" and 14" sizes. These bells contain no springs or moving parts except the plunger.

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These grids are made to fit all sizes of bells and fit snugly at the base of mechanism over the shell and are bird-proof.

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Manufacturers of Telechron Timekeeping Equipment

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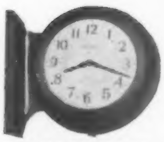

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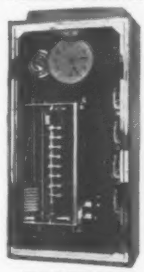
Telechron timekeeping equipment for schools includes classroom clocks, program clocks, combination signal boards, signal equipment and central control equipment for system installations.

All Telechron clocks are complete individual timekeepers and can be installed as individual devices or in a system on a separate wiring circuit.

All equipment operates directly from the 110 volt a.c. lighting current, the frequency of which directly controls their accuracy; . . . no local master clock to adjust, wind, or clean;* 110 volt current operation practically eliminates line losses and wiring problems; powerful self-starting individual synchronous motor-drive in each device prevents scattering; unaffected by dust, dirt or vibration; no batteries to service or replace; no clock relay complications. The largest single clock installation in the world operating from a single source of power is Telechron!



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* By means of a Telechron Master Clock installed in the local power company station, regulated frequency is available for the accurate operation of Telechron timekeeping equipment.

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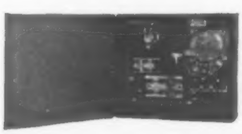
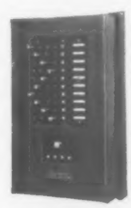


AUTOMATIC RESETTING DEVICE FOR CONTROLLING ADMR (AUTOMATIC DUAL MOTOR RESETTING) CLOCK SYSTEM



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EASTERN SENIOR HIGH SCHOOL, LYNN, MASS., WHICH IS EQUIPPED WITH AN ADFR (AUTOMATIC DOUBLE-FREQUENCY RESETTING) TELECHRON CLOCK SYSTEM CONSISTING OF 88 CLOCKS, A PROGRAM CLOCK AND CENTRAL CONTROL EQUIPMENT

ZENITHERM COMPANY, INC.

Manufacturers of

ZENITHERM

(For Walls and Floors)

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Zenitherm, the Material and Its Uses in Educational Buildings

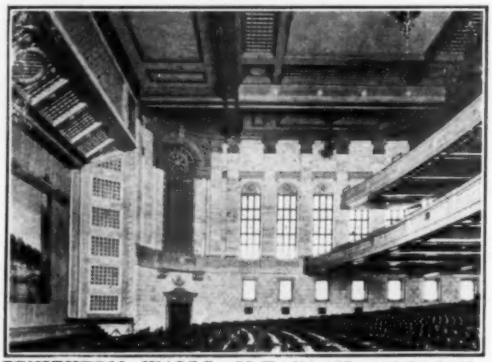
Zenitherm for walls and floors, and wall and floor accessories such as mouldings, trim, base, door saddles, stair treads and risers, is a modern, fire-resisting material for modern school and university buildings and the moderniizng of old school buildings. It simulates stone and endures like stone, yet meets the requirements for warmth and cheerfulness as well as economical maintenance. It solves the problem of selecting a satisfactory wall and floor treatment for corridors, auditoriums, auditorium-gymnasiums, libraries, lecture halls, museums, dormitories, administrative offices, etc.

Qualities and Properties

Zenitherm is impervious to any climatic conditions. Constant physical characteristics together with low thermal conductivity make Zenitherm preferable as a wall and floor material for educational buildings. For walls, Zenitherm's pleasing color tones complement scientific natural and artificial lighting arrangements. Its characteristic surface texture contributes in no small measure to proper sound control. For floors, Zenitherm fulfils the four essential characteristics of floor coverings in school buildings: cleanliness, warmth, quietness and adequate friction to avoid slipping.

Standard Colors

Zenitherm is made in 21 standard colors: natural, buff, gold, pink, coral pink, olive, drab, light grey, stone grey, light brown, dark brown, red, green, blue, black, tangerine, havana brown, maya brown, £1,000, sea green, lichen green. The fact that Zenitherm is available in different shades gives the architect ample opportunity to secure beautiful and permanent effects. Colors are obtained by mineral pigments, **not dyes.**



ZENITHERM WALLS, McFarlin Memorial Auditorium, Southern Methodist University, Dallas, Tex.
R. H. Hunt Company, Architects

Standard Sizes

Zenitherm is made in fifteen standard sizes. Other sizes can be furnished according to specifications. All Zenitherm wall and floor material is ⅝-inch thick.

Installation

Zenitherm presents no difficulties of installation. Wall material is face-nailed either to wood furring or sheathing, or to haired brown-coat of plaster. Floors are nailed over wood underfloors and laid in Zenitherm Bedding Compound over cement or wood underfloors. When nailed, all nail holes are rendered invisible by Zenitherm Pointing Compound.

Additional Data Available

Complete technical data on Zenitherm appears in Sweet's Architectural Catalogues. Also available on request are several booklets and folders, including "Zenitherm for Educational Buildings;" "Zenitherm for Architectural Interiors and Exteriors;" a Color Chart of standard colors; and "Floors of Character," a folder of Zenitherm floor designs in full color.

Precedent

The enviable reputation Zenitherm has gained for use in educational buildings is not founded on usage in that type of structure alone, but also upon the formidable precedent of installations in hundreds of the finest private homes, apartments, clubs, banks, hotels, theatres, stores, executive offices and churches.

ZENITHERM FLOORS in Library, Lehigh University, Bethlehem, Pa.
Theodore Visscher and James Burley, Architects

ZENITHERM WALLS in Main Corridor, Princeton High School, Princeton, N. J.
Ernest Sibley, Architect

Section III

MODERNIZATION AND MAINTENANCE

Modernizing the School Plant of an Old City

BY GEORGE DRAYTON STRAYER

DIRECTOR, DIVISION OF FIELD STUDIES, INSTITUTE OF EDUCATIONAL RESEARCH, TEACHERS COLLEGE, COLUMBIA UNIVERSITY, NEW YORK

ANY study of the school-building needs of an old city will of necessity begin with a survey of the plant as it at present exists. In most cases, certain buildings will be found so poorly planned and presenting such great hazards to life and physical welfare that their abandonment is imperative. Other buildings will usually be found that have the possibility of rehabilitation.

In an old city it is sometimes possible to abandon old buildings without erecting new structures, in sections which are rapidly being given over to industry and business. On the other hand, in some regions in which the school buildings are old and inadequate, the population is large and even sometimes increasing. In these cases, the modernizing of the school plant will manifestly require new buildings.

Score Cards Facilitate the Judging of Existing Buildings

In order to determine how far the program to be advanced may be one of modernizing old structures and in what cases it will be necessary to erect new buildings, a complete and detailed study of each building now in use should be made. In order to secure as great objectivity as is possible in doing this work, score cards for elementary school buildings and for high school buildings have been developed.*

The major items considered in these score cards are: (1) site; (2) general building structure; (3) service systems; (4) classrooms; and (5) special rooms. Under each of these heads a number of details are listed, and in each case a weighting is given to this particular factor in the total building situation. The total score for a perfect building is 1,000 points. The weight to be given to each item was determined by the judgment of architects, engineers and school administrators.

In the study of any particular building, the score given to any one of these heads may vary from zero to the maximum score allowed. For example, under site, the item of accessibility occurs. If all the children attending an elementary school live within one-half mile of the structure, and if no unusually dangerous railroad crossings or other hazards are to be encountered, the score would be 25. If, on the other hand, the children were scattered over a very much larger area and if the building were difficult and dangerous of approach, the score might go as low as 5 out of 25 points.

In like manner, the glass area for a classroom is given a weighting of 45 points on the score card. The standard requires that there be 20 per cent as much area in the glass in the windows as there is floor space, and that the light come from the left-hand side of the room. If these conditions are met, the score of 45 points will be allowed. Some rooms are so dark and have windows so badly placed that the score permitted would not be more than from 5 to 10 points out of the 45. This procedure of estimating is followed for every other item in the scoring of buildings.

The Results of a Survey in One Old City

In one old city in the eastern section of the country, with a present population around 100,000, a survey of this type was recently made, in which the elementary school buildings scored as follows:

TABLE 1

ELEMENTARY SCHOOL BUILDING SCORES IN AN OLD CITY
(Maximum scores in italics)

School No.	Site	Building	Service System	Class Rooms	Special Rooms	Total
	125	*165*	*280*	*290*	*140*	*1,000*
1	88	148	272	268	95	871
2	95	149	257	263	97	861
3	105	150	226	236	34	751
4	85	107	160	202	57	611
5	75	94	182	169	58	578
6	65	113	130	234	20	562
7	28	84	165	203	27	507
8	85	85	118	164	42	494
9	83	92	111	164	22	472
10	57	76	118	151	54	456
11	65	62	127	135	22	411
12	57	70	105	164	10	406
13	55	66	119	145	9	394
14	50	50	113	115	10	338
15	52	59	99	111	12	333
16	80	47	80	102	6	315
17	75	40	110	40	15	280
18	30	42	75	105	8	260
19	20	39	86	101	10	256
20	70	30	101	30	9	240
21	45	35	60	54	2	196
22	44	40	62	44	2	192
23	41	25	64	55	2	187

* "Score Cards and Standards for Elementary School Buildings," and "Score Cards and Standards for High School Buildings," by George D. Strayer, and N. L. Engelhardt.—Bureau of Publications, Teachers College, Columbia University.

It will be observed from this table that the poorest building in the group scored 187 points and that the best one scored 871 points out of 1,000.

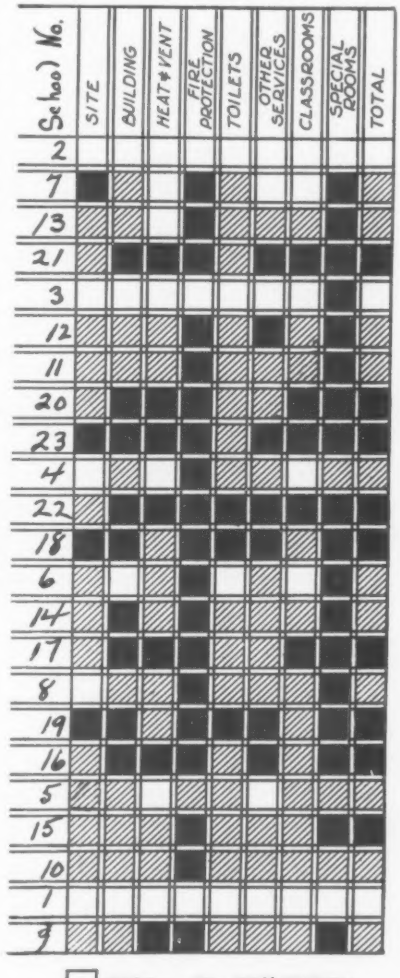
Buildings with Very Low Scores Are Not Worth Modernizing

It is reasonably clear from this scoring that the six or seven buildings at the bottom of the list, namely, numbers 17 to 23 inclusive, are so inadequate in all the particulars scored that the problem of rehabilitation is made extremely difficult, if not impossible. These buildings should be slated for early abandonment because they are placed upon inadequate sites; because they are in every case of highly inflammable character and on this account present a great hazard to the lives of the children accommodated in them; because they have inadequate heating and ventilating plants, poor artificial lighting and, for the most part, inadequate and insanitary toilet facilities; because the classrooms are poorly shaped and poorly lighted, with no possibility of being made into attractive rooms without excessive cost; and because there is an absence of playrooms, auditoriums, gymnasiums and other desirable special facilities for pupils and teachers.

A Graph Discloses Inadequacies

Ordinarily it is not difficult to convince a board of education of the wisdom of abandoning such buildings. A presentation of the inadequacy of these buildings is given in the graph appearing on this page.

It will be observed from a study of this diagram that few of the schools are credited with good sites. In some cases accessibility and pleasing surroundings have permitted a score which needs to be discounted on account of the lack of play space.



ELEMENTARY SCHOOL RATINGS FOR THE VARIOUS ITEMS ON THE SCORE CARD

The Amount of Playground Area Provided Is Important

In any consideration of the necessity of abandoning school buildings, the number of square feet of playground surface becomes important. In the city under consideration, only one building reaches the standard of 200 square feet per pupil; and it happens that those buildings that are poorest in other particulars are also lacking in proper playground area. The table which follows shows the playground area provided in connection with each of the buildings.

It is unfortunate that in the case of some of the older buildings which are needed in the older parts of the city, and which can be rehabilitated, the playground space is quite inadequate.

TABLE 2

PLAYGROUND AREA PER PUPIL IN THE ELEMENTARY SCHOOLS OF AN OLD CITY COMPARED WITH THE STANDARD COMMONLY ACCEPTED

200 Square Feet Per Pupil

SCHOOL No.	SQUARE FT. PER CHILD ENROLLED	PER CENT OF STANDARD
19	18	9%
18	19	10
12	22	11
10	22	11
11	31	16
1	31	16
23	32	16
22	33	17
21	34	17
5	34	17
7	34	17
8	39	20
14	44	22
13	46	23
20	47	24
6	57	29
2	58	29
4	66	33
17	74	37
16	93	47
15	119	60
3	153	77
9	221	110

The School Population Must Be Studied

Before finally determining on the expenditure of funds for old buildings, a study should be made of the number of children to be accommodated in the several areas surrounding these older buildings, compared with the school population for the same area for a period of years, and with the prospective enrolments for these areas. Such studies are based upon total population and school population figures that can ordinarily be obtained for the past twenty or thirty years. The number of new buildings erected and the nature of the development—whether manufacturing, business and commercial, or residential—must also be taken into

account. In the light of all these factors, it will appear that certain of the older buildings must be kept in use and that new structures must be built, especially in the rapidly growing sections of the city, in some cases to take the places of older buildings not subject to reconstruction.

Considering now the question of modernizing the old plant, we can follow the major heads of the score card to advantage.

Enlarging the Site Is Sometimes Possible

First, with respect to site, it may be possible to find adjoining land upon which are located structures of little value. Additional play space can be provided in these cases, and should be purchased by the board of education if the building is to continue in use over any considerable number of years. It often happens that the playground area needs to be reconditioned. This can be done by providing proper underdrainage with cinders, surfaced with loam and sand or clay and sand.

Fireproofing Is Essential and Not Always Expensive

When it comes to the general structure, the issue becomes one of safeguarding the lives and health of school children. Generally the most important reconstruction to be undertaken is the provision of fireproof stairways surrounded by fireproof walls and opening off the ends of the corridors of the building. Such new structures can be built into many old buildings at a minimum of cost. Two- and three-story buildings have been equipped with two such fireproof exits for a sum not exceeding $15,000 to $20,000.

Health Can Be Protected by Improving the Service Systems

Service systems can be installed in old buildings to the very great advantage of the children who are accommodated in them. It is perfectly possible to improve the heating and ventilating system by the installation of new equipment. Fire protection, in addition to that provided by the fireproof stairways, can be developed by fireproofing the furnace room and by the provision of fire extinguishers and fire doors. Artificial lighting can be brought up to standard by the introduction of proper wiring and fixtures. New toilet fixtures can be installed and proper facilities for washing and drinking can be provided.

Classrooms Can Be Rehabilitated and Converted into Special Rooms

Probably the most difficult problem that confronts the architect and the board of education in the rehabilitation of an old school building has to do with the classrooms. It is possible to provide new floors or floor coverings and to install good blackboards, but the main difficulty comes in day-lighting. But even in this case it has been found possible by the introduction of I-beams to provide more and better day-lighting on the left-hand side of the classroom. Obviously, it is possible to provide proper equipment in seats, desks, and the like.

Many of the older buildings are without the special rooms which are considered necessary in a modern school plant. It is possible, however, to provide a lunchroom in space formerly used for classroom purposes; to use one or more classrooms for a library; to develop a comfortable teachers' room and medical suite; and even to convert classrooms into fairly comfortable rooms for the teaching of household and industrial arts. The two large spaces that are difficult to provide are the auditorium and gymnasium. In some school systems this provision has been made by the erection of a temporary structure on the site, connected with the old building, which can be used for both purposes.

Many Cities Cannot Afford All the New Buildings Necessary

The total cost of such a program of rehabilitation will, in most cases, be only a small fraction of the cost of providing new buildings. The justification for engaging in such a program is found in the lack of financial ability of many cities to provide the new schoolhouses necessary on account of growth and, at the same time, to reconstruct completely the least adequate of their present school buildings.

As already suggested, any modernization of the buildings of an old city will involve new structures. The increase in attendance in the junior and senior high school grades will almost always require the construction of one or more new buildings to house this part of the school system. The planning of these new junior and senior high schools away from the center of the city, and on sites large enough to provide plenty of play space, is apt to attract the attention of the people of the city almost to the exclusion of the program of rehabilitation.

New Buildings Should Be Carefully Planned

It is of the utmost importance that the building program be based upon a careful study of the growth in total population and in school population over a period of years, and of the trends and shifts in population as indicated by residential developments. Where the city has enlarged its borders and is growing at an average rate, new elementary schools will have to be provided in the newer residential districts. It has usually been

found possible to have the board of education and the community as a whole accept the idea of sites as large as five acres for elementary schools; from ten to fifteen acres for junior high schools; and from twenty to forty acres or even more for senior high schools.

Necessary Rehabilitation Should Not Be Neglected

The program for the rehabilitation of old structures ought logically to precede or to be carried along with the program for new buildings. It often happens, however, that the program of new buildings will hold the attention and interest of the board of education and the public. It becomes the duty of the superintendent of schools and of the board of education to give proper consideration to the children who are housed in the older structures that are to be continued in use. The best that can be done for children who must continue to use the old buildings will still leave them less favorably provided for than are the children living in the newer sections of the city.

In the modernizing of the school plant of an old city, the program of rehabilitation should be considered as of at least equal importance with the provision of new school accommodations.

Planning a University from the Operating Point of View

BY JAMES M. WHITE

SUPERVISING ARCHITECT AND SUPERINTENDENT OF BUSINESS OPERATIONS, UNIVERSITY OF ILLINOIS, URBANA, ILL.

THE term "operation" in connection with a university usually means the management of the mechanical plant and the care of the buildings and grounds, but in the case of a large university it must also include certain relations with students, faculty, and the public. Among the latter may be included dormitory operation, the handling of public functions of all sorts, parking and traffic regulations, assignment of rooms for special purposes, the issuing of keys, etc.

A campus should be a restricted area with certain well-defined entrances and no through-traffic routes. In other words, as far as inter-community traffic is concerned, the campus should be considered just as though it were a lake. In fact, the ideal location for a university would be on an island large enough to care for all of the academic work and connected by a short bridge with a municipal business district, which would be the point of contact between town and gown, with hotels, dormitories, fraternities, and boarding-houses in the immediate vicinity. Such a location would insure to the classroom group of buildings the academic calm and quiet which is too rapidly becoming a thing of the past.

Most of our large institutions have been hampered in their growth by community development and therefore are now operating under conditions that are far from ideal. It is interesting to note that the University of California at Los Angeles, the University of Rochester in New York State, and Duke University at Durham, N. C., have re-established themselves on entirely new locations where they will be free from the disturbing influences of a municipal environment, and I have no doubt that many other universities will follow their example.[1] The University of Pittsburgh is trying to solve the problem by building upwards in a skyscraper in order to make the most of a limited ground area.[2]

The operating problems of course vary materially with the location and type of plan adopted. It is generally assumed today that all buildings will be fireproof, because valuable libraries and laboratories should have that measure of protection.

Group vs. Range Type of Building

We are often asked whether we prefer a group building plan or what is often termed the "range" type of building, permitting communication throughout the entire group and found most frequently where the Gothic style is employed. In general, I think the group plan will meet with more favor. The greater the diversity in the purposes to which buildings are put, the more advantageous this type of plan becomes. Some of its merits are:

1. The buildings can be isolated sufficiently to diminish the fire hazard and therefore they need not be absolutely fireproof.
2. Laboratories that are objectionable because of noise, vibration, or dirt can be isolated.
3. The problems of lighting and ventilating are simpler.
4. Story heights can be readily varied to suit conditions.

[1] An article on "The Building and Organizing of Duke University" was published in THE AMERICAN SCHOOL AND UNIVERSITY, Edition of 1928-1929, pp. 23-25.

[2] A description of "Pittsburgh's Forty-Story Cathedral of Learning" may be found in THE AMERICAN SCHOOL AND UNIVERSITY, Edition of 1930-1931, pp. 37-40.

THE NEW MEN'S COLLEGE GROUP AT THE UNIVERSITY OF ROCHESTER, ROCHESTER, N. Y.
As seen across the Genesee River

5. The expansion of departments is more readily accomplished.

6. Materials and equipment can be more easily handled.

7. Yard area can be available in immediate connection with each shop and laboratory.

8. Glass houses and outdoor gardens can be provided adjacent to biological laboratories.

9. Outdoor travel between classes is a stimulus which increases efficiency in the lecture hall and classroom.

Whether these buildings should have visible roofs depends on architectural style and the contour of the site, as well as on climatic conditions. I believe attics and basements are worth while, but do not advocate using either for classes. Excellent uses can be found for at least fifty per cent of such areas, in addition to their value as space for heating and ventilating equipment. The visible roof gives opportunity for a gutter outside the wall, which saves a lot of damage from leaks.

To Make Remodeling Easy

A recent inquirer asks: How can a building be built to make remodeling easy? The accompanying drawing shows a rather typical plan of one of our buildings. It will be noted that the corridor is off center, so that the offices and utility spaces are given less depth than the classrooms and laboratories, which are across the front of the building. All ducts, switches, thermostats, etc., are placed in the corridor walls, which must be permanent. This arrangement leaves the partitions so that they can be readily shifted to make the rooms larger or smaller. Of course, if a room having thermostatic heat regulation and ceiling lights on one switch is divided, there will be some trouble in separating these controls, but the uncertainty of making such changes will not justify the extra cost in anticipating them.

Distributing Central Station Services

How to distribute central station services is a much discussed question. Should the heat, light, and power lines be distributed through tunnels or conduits, or through the basements of the buildings? We formerly ran practically all our utility lines in tunnels. We found, however, that it is much better to have gas mains laid directly in the ground, so as to prevent any possible leaks into the tunnels, and in order not to expand the gas before it passes through the building meter.

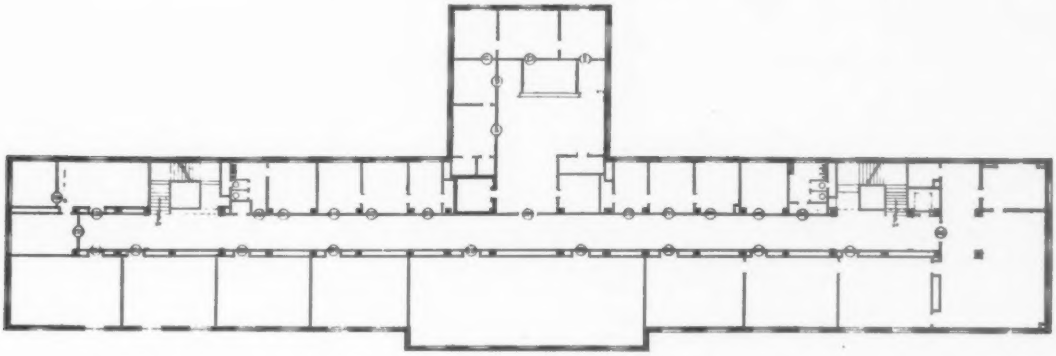
Water mains are objectionable in tunnels because of constant condensation; at our university they have been removed. As cables for electric power distribution proved to be hazardous in tunnels where men work in rather close quarters with heavy wrenches, they were taken out and put in standard underground conduits. Telephone lines were also removed and put in conduits because of the greater liability, even when lead-sheathed cables are used, of moisture getting into the cable.

Compressed air for use in laboratories and for temperature control may still be run in tunnels, if it is passed through condensation tanks buried in the ground just outside of the building to reduce it in temperature and thereby remove the moisture which otherwise would be condensed in the lines in the building and cause trouble.

This plan, then, leaves the steam and return lines as about the only services to be put into tunnels. Now that we have pipe which is almost rustless and can be welded (so there is little need of access to it), most of the lines are being put in independent conduits with manholes at proper intervals to provide for anchorage and expansion. Tunnels are becoming obsolete.

Where tunnels are used in a group plan, there is economy in using the building basements as a part of the tunnel system. It is impossible, however, to insulate steam pipes so as not to interfere with the use of adjacent space during the warmer weather, because steam must be kept on the mains the year round for water heating, stills, and sterilizers.

A main tunnel down the center of a campus with branches to the several buildings is not so advantageous as a loop layout with cross-con-



SECOND FLOOR PLAN OF THE NEW COMMERCE BUILDING AT THE UNIVERSITY OF ILLINOIS
Part of this building may be seen at the right in the photograph below

nections so planned that no matter where a shutdown occurs, service can be maintained around the loop. A conduit system is much more flexible and economical than are tunnels for this kind of layout, but there may be advantages in running a tunnel to a central distributing point from which the conduit lines can be looped.

Electricity—Snow—Automobiles

There is economy in generating electricity during the heating season, but not in summer, when low rates are usually offered by the utility companies because that season is off their peak. The indications are that boiler pressures in the plants of the larger institutions will have to be more than doubled because the electrical loads are increasing more rapidly than the heating loads, and because there will be greater economy in distributing steam with higher exhaust pressures.

The care of the grounds depends very greatly on climatic conditions and on the character of the site. The fact that Nature has created a

FROM LEFT TO RIGHT, THE MEN'S GYMNASIUM, THE ARCHITECTURAL BUILDING AND THE COMMERCE BUILDING AT THE UNIVERSITY OF ILLINOIS
This group illustrates the use of the Georgian style on the South Campus

beautiful campus does not make it any less necessary to see that it is properly maintained. In climates where there is snow, it is very desirable to eliminate steps in walks so that the snow may be quickly cleared with snow-plows, which, for this purpose, in spite of motors of all sorts, can still be best drawn by horses.

Automobile parking and control have become a serious matter. In general, no through traffic should be permitted on a campus, and special parking areas should be provided unless the adjacent streets prove adequate. If there are cross traffic streets, it is a wise precaution to use stop lights to halt all traffic during the periods of changing classes between eight a. m. and four p. m. Such lights can be operated from the class bell circuits. This regulation protects campus pedestrians from speeders, of whom late students rushing to classes in flivvers are the chief offenders.

Organization of Operating Units

Universities vary greatly in the organization of their operating units. Up to a certain size, a business manager is the natural officer to be in charge of the operating as well as the financial end of an institution. In the larger institutions, where the president's responsibilities are such that he cannot be expected to give much supervision to financial matters, it seems wise to segregate the financial control and accounting from the office of the business manager and to make the financial officer responsible for supervision of all budgetary matters and for the general accounting control. The financial officer should not be responsible for spending any money; that should be the function of the business manager. In this way the financial officer provides a thorough check upon all disbursements. The operating and maintenance division is usually under the business manager, and independent architects are employed for the design of buildings.

At the University of Illinois, the person in charge of all operation is also the architect. There are many advantages in that plan. The architect learns many things in the course of the operation of the plant which are decidedly helpful and which result in economies in the designing of buildings; for, as he has in mind at all times the planning of new buildings and their relation to one another in the academic group, there is sure to be a more logical campus development than where different architects are called in from time to time for consultation on location and design. But I do not believe that one architect should ever be entrusted with the development of a group plan. There should always be a consulting architect who would not expect to design any buildings, but who would be a restraining influence to avoid the kind of catastrophes which have marred so many campuses.

Problems of Size and Obsolescence

A question now worrying a lot of people is: How big can an educational institution become? Published enrolments are quite misleading from the operating standpoint, because they usually include all the students enrolled during a year and may represent double the number who have to be provided for at any one time in the building group. I see no reason at present to put any limit on possible enrolment. With the subdividing of a student body into colleges, each one of which may become a little university in itself, there is no reason for considering the entire university as a single unit; and though junior colleges are proposed as one solution, there are educational advantages and economies in expanding on one campus.

In small institutions it is customary to think of the library as being the central building in the group. With the larger institutions, departmental libraries are certain to develop and the library itself will become the center of activities for the graduate departments and not a place to be used as a general study hall, so it need not now be centrally located. The central location should be assigned to the science group, to which almost every student must go for laboratory instruction. Mathematics, rhetoric, languages, history, and similar classroom subjects can be taught in various places over the campus, but the laboratory work in general science must be so central that students whose major work is in college groups do not have too far to travel to their science courses.

It would be difficult to revamp present campuses to such a plan, a fact which accounts for the growing tendency to move universities to more adequate locations. Most of our colleges will continue to render splendid service at the old locations. Educational institutions are supposed to be founders of traditions, and buildings seem to be vital factors in perpetuating traditions. College buildings too infrequently give way because of obsolescence, but if it is worth while to teach respect for traditions, some of these old structures ought to be good laboratories for the purpose. Possibly there is such a thing as trying to be too up-to-date.

And Yet I Learned Architecture

Nearly forty years ago I was an architectural student in a drafting-room in Paris, France. The room was heated by a stove. The fire was built by the student who first arrived in the morning. In order to build the fire, he raked the ashes out into a pile in front of the stove, to be taken out at the end of the week by the concièrge. Candles were the only illuminant. We usually stuck a short one directly onto the triangle and pushed it around over the drawing so it would always be close to the point of the pencil or pen.

And yet I learned architecture.

Estimating School Equipment Costs — A Pupil-Station Method

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ESTIMATING equipment costs is still a laborious process in most cities of 100,000 or less. These cities have as a rule developed no standardized buildings, nor have they adopted standardized room lists. Every new building presents a new problem, and the superintendent and board in many cases depend entirely upon the architect or dealers for advice and information as to equipment needs.

Sometimes the practice of taking a certain percentage of the cost of the building is followed. Many factors, however, such as the size, type and construction of the building, the degree and quality of equipment, to say nothing of the type of program offered, make the lump-sum method totally inaccurate. Dr. A. K. Loomis has shown that the cost of equipment may vary from 4½ per cent to 18 per cent of the building cost when only a few of the factors involved are considered.*

A Pupil-Station Method Is Proposed

The method of estimating school equipment costs outlined in this article is in line with attempts to make school administration more scien-

* "School Equipment Costs—A Method of Estimating." Bureau of Publications, Teachers College, Columbia University, New York, 1926.

TOPIC RECITATION ROOM

TABULATION SHEET

				Column # 1 Minimum			Column # 2 Standard			Column # 3 Maximum		
Item #	Quantity	Stock #	Description	Economy	Average	Superior	Economy	Average	Superior	Economy	Average	Superior
1	2		Chairs, Bentwood	7.50	8.00	11.20						
2	1		Desk, Teacher's 30" x 44"	23.25	32.28	40.00						
3	1		Waste Basket	1.50	1.75	2.00						
4			Total Minimum	32.25	41.18	53.20						
5							32.25	41.18	53.22			
6	1		Closet, Supply and cloak--4', 2 doors				18.25	26.00	45.00			
7	1		Book Case, 2 doors				18.25	26.00	45.00			
8	1		Bulletin Board, 3' x 4' cork				9.50	12.45	14.00			
9	1		Chair, Swivel, Oak #317 or #318				10.50	14.45	15.75			
10	1		Pencil Sharpener				1.45	2.30	4.50			
11	1		Table, Oak 30" x 42"				9.50	11.75	19.50			
12			Total Standard				100.00	134.50	196.85			
13										100.00	134.50	196.85
14	1		Projection Lantern							50.00	90.00	200.00
15	1		Projection Screen, Translucent							20.00	27.00	38.00
16	1		Filing Cabinet, Steel, 4 drawers.							25.00	33.00	39.00
17			Total Maximum							195.00	284.50	472.00
18												
19												
20												
21												
22												
23												
24	35		Pupil desks #450 or #459	226.00	332.00	332.00	225.00	332.00	332.00	226.00	332.00	332.00
25			Total	251.25	373.50	385.00	326.00	466.00	529.00	424.00	616.00	806.00
26			Cost per pupil station	7.18	10.66	11.00	9.32	13.34	15.00	12.12	17.60	23.05
27			Index number	.552	.862	.825	.698	1.000	1.183	.908	1.321	1.727
28												
29	40		Pupil desks #450 or #459	258.00	380.00	380.00	258.00	380.00	380.00	258.00	380.00	380.00
30			Total	290.25	421.18	433.20	358.00	514.50	576.00	453.00	664.00	854.00
31			Cost per pupil station	7.25	10.53	10.83	8.95	12.86	14.40	11.32	16.60	21.35
32			Index number	.543	.791	.812	.672	.964	1.081	.856	1.245	1.601

TABLE 1

Listed in this table are the minimum standard and maximum amounts of equipment likely to be used in a typical recitation room. As the quality of these articles may vary, prices (at the 1925 level) are given for three different grades of goods—economy, average and superior.

The cost of providing equipment for one pupil in an average-typical room, $13.34, is taken as a base for working out index numbers for the eight other pupil-stations analyzed in the following tables. (This is the middle figure in the second column in the sixth line from the bottom.)

tific. The method proposes that equipment costs be based on the *kinds* and *numbers* of *pupil stations* to be provided, in the belief that it is possible to develop a "typical room" for each kind of station.

By "pupil station" is meant the accommodations necessary to enable one pupil to carry on the work of a particular class. For example, in a recitation room having 35 pupil desks there are said to be 35 pupil stations. The cost chargeable to each station is not only the cost of the pupil's individual desk but, in addition, 1/35 of the cost of such general items as chairs, table, teacher's desk, bookcases, etc., which contribute to the work of the class. In the same way, the cost of the general equipment in a shop or laboratory is spread over the individual pupils served.

Comparison Possible by Means of Index Numbers

The proposed method of estimating costs assumes that a definite ratio exists between the pupil-station cost in a typical recitation room and that in a laboratory or shop or auditorium, and that it is therefore possible to obtain index numbers to express this relation. These pupil-station index numbers can be combined in table form, thereby making it possible tc estimate or check equipment costs for a building in a fraction of the time ordinarily required.

A pupil-station index number is the ratio of the cost of one station to the cost of another station which has been taken as a base and given the value of 1 or unity. Since the recitation-room pupil station occurs with greater frequency than any other, and since it is common practice to put thirty-five desks in the high-school room, the cost of this station, using a standard degree of equipment of average quality, has been selected as the base. This cost is $13.34 at 1925 prices, as indicated in Table No. 1.

The pupil-station cost in an auditorium seating 500 with a standard degree of equipment of average quality is $10.08 (see Table No. 9). Dividing this cost by $13.34, we have for the auditorium the index number .755. Present costs are calculated by multiplying the 1925 costs by the present general furniture index.*

* This index may be obtained by writing to N. L. Engelhardt, Associate Director of the Division of Field Studies, Institute of Educational Research, Teachers College, Columbia University, New York.

TABULATION SHEET

TOPIC PHYSICS LABORATORY

Item #	Quantity	Stock #	Description	Column # 1 Minimum Economy	Column # 1 Minimum Average	Column # 1 Minimum Superior	Column # 2 Standard Economy	Column # 2 Standard Average	Column # 2 Standard Superior	Column # 3 Maximum Economy	Column # 3 Maximum Average	Column # 3 Maximum Superior
1	2		Balance Shelves #1913 or #1911	32.00	66.00	66.00						
2	1		Instructor's Desk #1600 or #1640 or #1700	125.00	190.00	369.00						
3	1		Storage Case #6460	110.00	110.00	110.00						
4	1		Apparatus Case #6040 or #6050	115.00	134.00	134.00						
5	1		Notebook Case #6500 or #6510	70.00	95.00	95.00						
6	1		Laboratory Sink, Wood, Lead-lined or #4770 Stone	45.00	45.00	90.00						
7			Total Minimum	497.00	640.00	864.00	497.00	640.00	864.00			
8	1		Motor-Generator Set --½HP or 2HP or 5HP				150.00	210.00	390.00			
9	1		Notebook Case #6510				95.00	95.00	95.00			
10	1		Key Cabinet #6550				42.00	42.00	42.00			
11	1		Wall Table #1920				67.00	67.00	134.00			
12	1		Apparatus Case #6040				115.00	115.00	115.00			
13	2		Display Case #6360				250.00	250.00	250.00			
14	1		Work Bench #6040 or #6160 or #6520				22.00	31.00	55.00			
15			Total Standard				1238.00	1450.00	1945.00	1238.00	1450.00	1945.00
16	1		Balance Case #1900							116.00	116.00	116.00
17	2		Notebook Cases #6510							190.00	190.00	190.00
18	1		Lantern Stand #3722 or #3720							45.00	75.00	75.00
19	1		Tube Case #6400							45.00	45.00	45.00
20	1		Wall Case #6050							134.00	134.00	134.00
21	1		Projection Screen, Translucent							20.00	27.00	38.00
22	1		Projection Lantern							50.00	90.00	200.00
23			Total Maximum							1830.00	2127.00	2740.00
24	6 or 12		Four-Student Physics Tables #2150 or #2050 or #1062	378.00	660.00	2448.00	378.00	660.00	2448.00	378.00	660.00	2448.00
25			Capacity 24 pupils Total	785.00	1300.00	3312.00	1616.00	2110.00	4393.00	2116.00	2787.00	5191.00
26			Cost per pupil station	36.46	54.13	138.00	67.00	87.93	183.03	88.15	116.13	216.31
27			Index number									
28												
29	8 or 16		Four-Student Physics Tables #2150 or #2050 or #1062	504.00	880.00	3264.00	504.00	880.00	3264.00	504.00	880.00	3264.00
30			Capacity 32 pupils Total	1001.00	1520.00	4128.00	1742.00	2330.00	5209.00	2378.00	3007.00	6007.00
31			Cost per pupil station	31.27	47.50	129.00	54.42	72.81	162.72	74.31	93.97	187.71
32			Index number									
33												

TABLE 2

These prices are at the 1930 level, and index numbers have not been computed

The Frequency of Various Types of Pupil Stations

In attempting to estimate costs by the pupil-station method it is necessary first of all to discover the kinds of pupil stations provided for in schools throughout the country. Dr. Leonard V. Koos found from an examination of 156 high school plans* that space provisions were made, in part, as follows:

Name of Space Provisions	Per Cent of Buildings Making Such Provisions
Recitation rooms	99.4
Principal's office	86.5
Boys' toilets	82.7
Girls' toilets	82.0
Assembly room or auditorium	76.9
Library room	65.4
Stage (in auditorium)	61.5
Chemistry laboratory	57.7
Gymnasium	55.1
Physics laboratory	53.8
Lecture or demonstration room (science)	50.6

* "Space Provisions in the Floor Plans of Modern High School Buildings," *School Review*, vol. XXVII, Oct., 1919, pp. 573-599.

Name of Space Provisions	Per Cent of Buildings Making Such Provisions
Storage room	50.6
Boys' locker room	47.4
Girls' locker room	46.8
Manual training room or shop	43.6
Cooking room or laboratory	42.3
Reception or waiting room (to principal's office)	41.7
Sewing-room or laboratory	38.5
Study rooms or halls	37.8
Mechanical drawing or draughting room	35.3
Teachers' rest or sitting room	34.6
Dressing or anterooms (for stage in audi.)	34.5
Dining room (for home economics)	33.3
Janitor's room	32.7
Biology laboratory	31.4
Lavatories or shower rooms	31.4
Wardrobe or cloakroom	30.8
Typewriting room	29.4
Apparatus room (for science)	28.8
Commercial room	26.3

Dr. Koos has also compiled a similar table for elementary schools. For the purpose of this paper we may assume these figures to represent the frequency with which such pupil stations occur.

TOPIC CHEMISTRY LABORATORY

TABULATION SHEET

				Column # 1 Minimum			Column # 2 Standard			Column # 3 Maximum		
Item #	Quantity	Stock #	Description	Economy	Average	Superior	Economy	Average	Superior	Economy	Average	Superior
1	1		Instructor's Table #1600 or #1700	125.00	274.00	351.00						
2	1		Fume Hood #1530 or #1520 or #1542	137.50	170.00	204.00						
3	1		Notebook Case #8500 or #8510	70.00	95.00	95.00						
4	1		Key Cabinet #8810 or #8850	18.00	42.00	42.00						
5	1		Storage Case #1860	95.00	134.00	134.00						
6	1		Apparatus Case #8040	115.00	115.00	115.00						
7	1		Display Case #8470	85.00	85.00	85.00						
8	1		Balance Shelves #1913	16.00	33.00	33.00						
9	1		Laboratory Sink - Wood, Lead-lined or #4770 Stone	15.00	45.00	45.00						
10			Total Minimum	676.50	993.00	1104.00	676.50	993.00	1104.00			
11	1		Notebook Case #8510				95.00	95.00	95.00			
12	1		Fume Hood #1530 or #1520				137.50	170.00	180.00			
13	1		Storage Case #1860				95.00	95.00	95.00			
14	1		Apparatus Case #8050				134.00	134.00	134.00			
15	1		Laboratory Sink - Wood, Lead lined, or Stone #4770				15.00	45.00	45.00			
16	1		Wall Table #1920, Wood or Stone Top				67.00	67.50	79.50			
17	1		Projection Screen - Translucent				20.00	27.00	38.50			
18	1		Lantern Stand #3722 or #3720				45.00	45.00	75.00			
19			Total Standard				1120.50	1599.50	1755.00	1120.50	1599.50	1755.00
20	1		Balance Case #1900							116.00	116.00	116.00
21	1		Tube Case #8400							75.00	75.00	75.00
22	1		Display Case #8460							110.00	110.00	110.00
23	1		Wall Table #1920 Wood or Stone top							67.50	67.50	79.50
24			Total Maximum							1654.00	2040.00	2227.00
25	6		4-Student Chemistry Tables #1001	1290.00	1590.00	1662.00	1290.00	1590.00	1662.00	1290.00	1590.00	1662.00
26			Capacity, 24 students Total	1966.50	2583.00	2766.00	2510.50	3189.50	3395.00	2944.00	3630.00	3889.00
27			Cost per pupil station	81.94	107.63	115.25	104.60	132.89	141.46	122.67	151.25	155.56
28			Index number									
29	3		12 ft. Chemistry Tables #1330 or #1340	1605.00	1905.00	1977.00	1605.00	1905.00	1977.00	1605.00	1905.00	1977.00
30			Capacity, 24 students Total	2281.50	2898.00	3081.00	2825.50	3504.50	3710.00	3259.00	3945.00	4204.00
31			Cost per pupil station	95.06	120.75	128.38	117.73	146.02	154.58	135.79	164.38	175.17
32			Index number									
33	12		Multi-Service Chemistry Tables #1082 Wood or Stone top	2448.00	2448.00	2532.00	2448.00	2448.00	2532.00	2448.00	2448.00	2532.00
34			Capacity, 24 students Total	3124.50	3441.00	3636.00	3668.50	4047.00	4266.00	4102.00	4488.00	4757.00
35			Cost per pupil station	130.19	143.38	148.50	152.85	168.65	177.75	170.92	187.00	198.[illegible]
			Index number									

TABLE 3

These prices are at the 1930 level, and index numbers have not been computed.

If the fume hood (item 12) cannot be operated by a gravity stack, an additional amount, ranging from $300 to $800, for an exhaust fan, motor and starter box, must be added to the cost.

The Development of Typical Rooms

It should next be possible to develop an acceptable set-up for each kind of pupil station by examining Strayer and Engelhardt's building standards,* by studying the standard lists developed by some of the larger school systems, and by analyzing information obtained by questionnaires.

The equipment of such typical rooms varies widely in both amount and quality, but in most cases there are certain *minimum* constants always present. In addition to this minimum, additional equipment is always desirable, which, when added, would make what we will call a *standard* set-up. Then there is the final degree wherein all the articles that can be justified are included. We will call this the *maximum* stage.

The quality of the equipment can be graduated by using the three 1925 price levels recorded by Loomis, taking for granted that price is a fair measure of quality. These three price levels we could designate as the economy, the average and the superior level.

* Published by the Bureau of Publications, Teachers College, Columbia University.

Two Classes of Rooms

It is apparent that at least two sets of typical rooms would have to be worked out, one for elementary and another for secondary schools. Perhaps it would be wise to split the secondary list into Junior and Senior groups.

In any event, these lists show that schoolrooms in any building fall into two classes, the recitation room, shop, laboratory, etc., in which classwork is carried on with groups of 20 to 40 or 45 pupils, and rooms like the auditorium, cafeteria and library, designed to serve larger groups of up to 1,500 or more. The first of these classes we have called the small-group rooms and the second the large-group, or general-service rooms.

Cost Decreases as Size of Room Increases

In developing the "Typical Room" cost sheets, the cost per pupil station is shown for each increase of pupils running from 20 to 40 for the small rooms. A very material saving could be effected in many buildings if laboratories and

TOPIC BIOLOGY LABORATORY

TABULATION SHEET

Item #	Quantity	Stock #	Description	Column # 1 Minimum: Economy	Column # 1 Minimum: Average	Column # 1 Minimum: Superior	Column # 2 Standard: Economy	Column # 2 Standard: Average	Column # 2 Standard: Superior	Column # 3 Maximum: Economy	Column # 3 Maximum: Average	Column # 3 Maximum: Superior
1	1		Instructor's Desk #1600 or #1650 or #1680	125^{00}	220^{00}	305^{00}						
2	1		Storage Case #8360	125^{00}	125^{00}	125^{00}						
3	1		Display Case #8460	110^{00}	110^{00}	110^{00}						
4	1		Notebook Case #8500 or #8510	70^{00}	95^{00}	95^{00}						
5	1		Aquarium 5 gal.	8^{00}	8^{00}	8^{00}						
6	1		Germinating Bed #3500	84^{00}	84^{00}	84^{00}						
7	1		Wall Table #1920	67^{00}	67^{00}	67^{00}						
8	1		Laboratory Sink, Lead or #4770 Stone	18^{00}	45^{00}	45^{00}						
9			Total Minimum	607^{00}	754^{00}	846^{00}	607^{00}	754^{00}	846^{00}			
10	1		Projection Screen, Aluminum or Translucent				20^{00}	27^{00}	38^{00}			
11	1		Lantern Stand, #3722 or #3720				45^{00}	45^{00}	75^{00}			
12	1		Storage Case #8360				125^{00}	125^{00}	125^{00}			
13	1		Notebook Case #8510				95^{00}	95^{00}	95^{00}			
14	1		Display Case #8460				110^{00}	110^{00}	110^{00}			
15	1		Key Cabinet #8810 or #8850				18^{00}	18^{00}	42^{00}			
16			Total Standard				1020^{00}	1174^{00}	1327^{00}	1020^{00}	1174^{00}	1327^{00}
17	1		Storage Case #8360							125^{00}	125^{00}	125^{00}
18	1		Notebook Case #8510							95^{00}	95^{00}	95^{00}
19	1		Display Case #8460							110^{00}	110^{00}	110^{00}
20	1		Micro Projection Attachment or Complete Projector-B & L							22^{00}	193^{00}	212^{00}
21	1		Sliding Blackboard #1750							170^{00}	170^{00}	170^{00}
22	1		Aquarium #3610 or #3600							100^{00}	130^{00}	130^{00}
23	1		Microscope Case #8250							68^{00}	68^{00}	68^{00}
24	1		Work Bench #6040 ro #6180 or #6520							22^{00}	31^{00}	55^{00}
25			Total Maximum							1732^{00}	2095^{00}	2292^{00}
26	12		Two-Pupil Biology Tables #3080 or #3090 or #1095	900^{00}	1020^{00}	1860^{00}	900^{00}	1020^{00}	1860^{00}	900^{00}	1020^{00}	1860^{00}
27			Capacity 24 pupils Total	1507^{00}	1774^{00}	2702^{00}	1920^{00}	2194^{00}	3187^{00}	2932^{00}	2785^{00}	4152^{00}
28			Cost per pupil station	62^{79}	73^{92}	112^{58}	80^{00}	91^{42}	132^{79}	95^{38}	116^{04}	173^{00}
29			Index number									
30												
31	16		Two-Pupil Biology Tables #3080 or #3090 or #1095	1200^{00}	1360^{00}	2480^{00}	1200^{00}	1360^{00}	2480^{00}	1200^{00}	1360^{00}	2480^{00}
32			Capacity 32 pupils Total	1807^{00}	2114^{00}	3322^{00}	2220^{00}	2534^{00}	3807^{00}	2932^{00}	3455^{00}	4772^{00}
33			Cost per pupil station	56^{47}	66^{06}	103^{81}	69^{38}	79^{19}	118^{97}	91^{63}	107^{97}	149^{13}
34			Index number									

TABLE 4

These prices are at the 1930 level, and index numbers have not been computed

shops were designed and equipped for 30 or 35 pupils instead of the usual 20 or 25. There is very little evidence, aside from tradition and opinion, that classes of this size cannot be successfully taught.

For large group rooms, the cost is recorded for steps of 20 or 50 pupils. This cost per station decreases as the number of pupils served by the same general equipment is increased.

Again, in the case of auditoriums and cafeterias, the number of pupils served by a given size of central equipment is limited, and such sheets will have to show costs for possibly three size ranges.

A Typical Recitation Room

By way of illustration, Table No. 1 shows this set-up for a typical recitation room. The equipment listed may not be generally acceptable but will serve to demonstrate the plan. The articles named in the first group and placed in the minimum column are considered the minimum constants mentioned before; these, taken together with the pupil desks, give us the cost per pupil station for a given number of seats. For example, reading down the economy column under minimum equipment to the item 40 pupil desks, we find that it costs $7.25 per station where we put 40 desks in the room and use the least equipment of the cheapest grade practicable.

The second group of general articles priced under "standard" includes those which are recommended as desirable and which, taken together with the constants, we will call the "standard" set-up. Down below, under "standard," the costs per station for 30-, 35-, and 40-pupil rooms are shown. In the same way the station cost when using maximum equipment is shown in column three.

Other Costs May Be Expressed as Index Numbers

If we take the cost per station of $13.34 in a room with 35 pupil desks and standard equipment of average quality as the base, the ratio of the cost of all other combinations can be expressed as an index number.

In a similar way, a typical room set-up can be developed for all the commoner kinds of pupil stations, and the cost per station can be expressed in terms of the typical recitation station cost of $13.34 taken as 100.

After these index numbers have been found, they can be assembled in table form to show at a glance the relative cost of the various stations in any of the combinations.

(*Continued on page 172*)

TOPIC GENERAL SCIENCE OR RECITATION

Item #	Quantity	Stock #	Description	Column # 1 Minimum			Column # 2 Standard			Column # 3 Maximum		
				Economy	Average	Superior	Economy	Average	Superior	Economy	Average	Superior
1	1		Instructor's Desk #1600 or #1650 or #1700	125.00	220.00	351.00						
2	1		Wall Case #8060	80.00	80.00	80.00						
3	1		Wall Case #8070	100.00	100.00	100.00						
4			Total Minimum	305.00	400.00	531.00	305.00	400.00	531.00			
5												
6	1		Wall Case #8380 or #8360				95.00	125.00	125.00			
7	1		Lantern Stand #3722 or #3720				45.00	75.00	75.00			
8	1		Wall Table #1920				67.00	67.00	67.00			
9	1		Notebook Case #8510				95.00	95.00	95.00			
10	1		Wall Sink, Wood, Lead-lined or #4770 Stone				15.00	45.00	45.00			
11	1		Projection Screen-Tranclucent				20.00	27.50	38.50			
12	1		Aquarium,5 Gal. #3610 or #3600				8.00	100.00	130.00			
13	1		Projection Lantern				50.00	90.00	200.00			
14			Total Standard				700.00	1024.50	1306.50	700.00	1024.50	1306.50
15	1		Microscope Case #8250							130.00	130.00	130.00
16	1		Work Bench #6040 or #6180 or #6500							22.00	31.00	57.00
17	1		Fume Hood #1530 or #1530 or #1542							137.00	170.00	204.00
18	1		Notebook Case #8510							95.00	95.00	95.00
19	1		Micro Projection Attachment							22.00	22.00	22.00
20			Total Maximum							1107.00	1472.50	1815.50
21												
22	15		Two-pupil Multi-Service Tables #2500 or #2501 or #2605	525.00	705.00	915.00	525.00	705.00	915.00	525.00	705.00	915.00
23			Capacity 30 pupils Total	830.00	1105.00	1446.00	1225.00	1729.50	2221.50	1632.00	2177.50	2721.50
24			Cost per pupil station	27.65	36.83	48.20	40.83	57.65	74.05	54.40	72.58	91.00
25			Index number									
26												
27	18		Two-pupil Multi-Service Tables #2500 or #2501 or #2605	630.00	846.00	1098.00	630.00	846.00	1098.00	630.00	846.00	1098.00
28			Capacity 36 pupils Total	935.00	1246.00	1629.00	1330.00	1870.00	2404.50	1737.00	2318.00	2913.00
29			Cost per pupil station	25.97	34.61	45.25	36.94	51.93	66.79	48.25	64.38	80.92
30			Index number									
31												

TABLE 5

These prices are at the 1930 level, and index numbers have not been computed

TOPIC AUDITORIUM AND STAGE
CAPACITY 200 to 500 PUPILS

TABULATION SHEET

Item #	Quantity	Stock #	Description	Column # 1 Minimum: Economy	Average	Superior	Column # 2 Standard: Economy	Average	Superior	Column # 3 Maximum: Economy	Average	Superior
1	6		Chairs, Arm	47	58	70						
2	1		Table - 30 x 42 oak or 30" x 60"	10	12	15						
3	1		Motion Picture Machine - Portable or Standard	180	600	1500						
4	1		Motion Picture Screen, Roller or Drop	15	35	65						
5	1		Curtain - Stage velour 30' to 36' Arch	250	350	600						
6			Total Minimum	502	1056	2150						
7							502	1056	2150			
8	1		Blackboard - Portable				14	17	21			
9	1		Piano - Upright or Grand				285	600	1000			
10	1		Interior Set				200	450	600			
11	4		Tormentors or Legs to match Curtain				400	700	1000			
12	1		Rug 9 x 12 or Larger				90	150	250			
13	1		Stereopticon				65	110	200			
14	1		Table, 30 x 42 Oak or 30" x 60"				10	12	15			
15			Total Standard				1566	3065	5237			
16										1566	3065	5237
17	1		Garden Set							200	420	600
18			Window Drapes to Match Curtain							100	250	400
19	6		Upholstered Chairs							180	300	450
20	1		Library Table							35	50	75
21	1		Baby Spot Light							56	92	92
22	2		Flood Lights, Single or Three Way							96	96	340
23	1		Sound on Disc Attachment for Projector							500	1000	1500
24	1		Voice Reproducer Equipment (Loud Speakers)							100	250	500
25	2		Side Curtains							400	700	700
26	1		Back Drop							200	350	500
27			Total Maximum							3413	6574	[illegible]
28												
29	200		Auditorium Chairs	680	790	872	680	790	872	680	790	872
30			Total	1182	1840	3022	2246	3865	6609	4413	7344	11266
31			Cost per pupil station	5	9	15	11	19	30	20	36	56
			Index number	443	.692	1.133	842	1.445	2.290	1.542	2.753	4.223
	300		Auditorium Chairs	1020	1185	1308	1020	1185	1308	1020	1185	1308
			Total	1522	2241	3458	2751	4270	6257	4483	7719	11705
			Cost per pupil station	5	7	11	9	14	20	14	25	29
			Index number	.330	.658	.840	.687	1.092	1.564	1.088	1.939	2.174
	400		Auditorium Chairs	1360	1580	1744	1360	1580	1744	1360	1580	1744
			Total	1808	2636	3894	2926	4646	6981	4795	8154	12135
			Cost per pupil station	4	6	9	7	11	17	11	20	30
			Index number	.339	.490	.729	.567	.870	1.308	.898	1.528	2.274
	500		Audtiorium Chairs	1700	1975	2180	1700	1975	2180	1700	1975	2180
			Total	2202	3031	4585	3666	5696	7467	5135	8524	12574
			Cost per pupil station	4	6	8	6	10	14	10	17	25
			Index number	.229	.454	.649	.489	.755	1.111	.769	1.278	1.884

TABLE 6

Stage lighting costs vary greatly with the size and use of the auditoriums, and are usually figured in the electrical contract. The following prices will give a rough idea of the cost:

Footlights in troughs—about \$2 per light installed.
Disappearing footlights in 5-foot sections and 3 colors—\$60 per section, and approximately \$100 for average installation.
Border lights in 3 colors—\$6-\$12 per foot on an average, and \$50 to hang each section.
A switchboard for a small installation, without dimmers—\$150-\$200. With dimmers—about \$500.
A complete switchboard for a large auditorium elaborately equipped—\$1,000-\$1,800.

TOPIC .. AUDITORIUM AND STAGE
CAPACITY 600 to 1,500 PUPILS

TABULATION SHEET

Item #	Quantity	Stock #	Description	Column # 1 Minimum			Column # 2 Standard			Column # 3 Maximum		
				Economy	Average	Superior	Economy	Average	Superior	Economy	Average	Superior
1	6		Chairs, Oak Arm	47.50	58.00	70.00						
2	1		Table 30" x 42" or 30" x 60" Oak	10.00	12.00	15.00						
3	1		Motion Picture Machine Standard	600.00	1000.00	1600.00						
4	1		Motion Picture Screen 10' x 10'	35.00	60.00	85.00						
5	1		Stage Curtains 36' to 78' arch	500.00	750.00	1000.00						
6	1		Piano	285.00	600.00	800.00						
7	1		Blackboard	14.00	17.00	21.00						
8			Total Minimum	1491.50	2498.00	3592.00						
9							1491.50	2498.00	3592.00			
10	1		Interior Set				400.00	650.00	1000.00			
11	1		Garden Set				400.00	650.00	1000.00			
12	4		Tormentors				800.00	1200.00	1600.00			
13	6		Upholstered Chairs				180.00	300.00	450.00			
14	1		Library Table				35.00	50.00	75.00			
15	1		Rug				150.00	250.00	500.00			
16	1		Stereopticon				65.00	110.00	200.00			
17	1		Table 30" x 42" or 60" or 72"				10.00	12.50	15.00			
18	1		Baby Spot Light				56.00	92.00	92.00			
19			Window Drapes to Match Curtains				200.00	400.00	600.00			
20			Total Standard				3787.50	6213.00	9124.00			
21										3787.50	6213.00	9124.00
22	2		Flood Lights							96.00	96.00	346.00
23	1		Concert Grand Piano							1500.00	1500.00	1500.00
24	2		Side Curtains							500.00	750.00	1000.00
25	1		Back Drop							500.00	750.00	1000.00
26	1		Sound and Disc Attachment							500.00	1000.00	1500.00
27	1 set		Stage Loud Speakers							250.00	400.00	650.00
			Total Maximum							7132.50	10709.00	15174.00
	600		Auditorium Chairs	2040.00	2370.00	2616.00	2040.00	2370.00	2616.00	2040.00	2370.00	2616.00
			Total	3531.50	4868.00	6208.00	5827.50	8583.00	11740.00	9173.50	13079.00	17740.00
			Cost per pupil station	5.88	8.11	10.35	9.71	14.31	19.57	15.29	21.80	29.57
			Index number	.440	.607	.775	.727	1.072	1.467	1.146	1.634	2.215
	750		Auditorium Chairs	2550.00	2992.00	3270.00	2550.00	2992.00	3270.00	2550.00	2992.00	3270.00
			Total	4041.50	5490.00	6862.00	6337.50	9205.00	12394.00	9682.50	13701.00	18390.00
			Cost per pupil station	5.39	7.32	9.15	8.45	12.27	16.53	12.91	18.27	24.52
			Index number	.404	.548	.685	.633	.919	1.239	.967	1.369	1.837
	1000		Auditorium Chairs	3400.00	3950.00	4360.00	3400.00	3950.00	4360.00	3400.00	3950.00	4360.00
			Total	4891.50	6448.00	7952.00	7187.50	10163.00	13484.00	10532.50	14659.00	19480.00
			Cost per pupil station	4.89	6.45	7.95	7.19	10.16	13.48	10.53	14.66	19.48
			Index number	.366	.483	.595	.538	.761	1.010	.789	1.098	1.459
	1250		Auditorium Chairs	4250.00	4937.50	5450.00	4250.00	4937.50	5450.00	4250.00	4937.50	5450.00
			Total	5741.50	7435.50	9042.00	8037.50	11150.50	14574.00	11382.50	15646.50	20570.00
			Cost per pupil station	4.59	5.95	7.23	6.43	8.92	11.66	9.11	12.52	16.46
			Index number	.344	.446	.541	.482	.668	.874	.682	.937	1.233
	1500		Auditorium Chairs	5100.00	5925.00	6540.00	5100.00	5925.00	6540.00	5100.00	5925.00	6540.00
			Total	6591.50	8423.00	10132.00	8887.50	12138.00	15664.00	12232.50	16634.00	21660.00
			Cost per pupil station	4.39	5.62	6.75	5.93	8.09	10.44	8.16	11.09	14.44
			Index number	.329	.421	.505	.444	.606	.782	.611	.831	1.080

TABLE 7

The increased cost of a large auditorium, after the space is provided, is mainly in the lighting equipment and curtains. For lighting equipment costs, see the opposite page.

For curtains, fast-color cotton velour in 50-inch width costs $3.50 to $6.00 per yard. Fast-color silk velour costs $8.00 to $20.00 per yard. One-third more than width of opening should be allowed for fullness. Front and side curtains are often made double-faced, that is, two curtains are sewed together back to back.

The hanging tackle and the cost of labor in making up the curtains will average $1.50 per yard of material used. Fringe, if used, will cost $3.00 to $5.00 per yard.

TOPIC GIRLS' GYMNASIUM

TABULATION SHEET

Item #	Quantity	Stock #	Description	Column # 1 Minimum Economy	Column # 1 Minimum Average	Column # 1 Minimum Superior	Column # 2 Standard Economy	Column # 2 Standard Average	Column # 2 Standard Superior	Column # 3 Maximum Economy	Column # 3 Maximum Average	Column # 3 Maximum Superior
	1		Horse	78	100	180						
	1		Buck	45	60	100						
	2		Climbing Ropes	24	24	24						
	1		Spring Board	32	40	60						
	2 prs.		Jump Standards	32	80	80						
	1 doz.		Jump Sticks	2	2	2						
	6		Mats, 2" x 4' x 6'	115	115	115						
	2		Medicine Balls 6 & 8 lb.	21	21	21						
	1		Volley Ball Outfit	21	21	21						
	1		Indoor Shot #8	11	11	11						
	3		Stall Bars	48	48	48						
	1		Adjustable Ladder	144	208	208						
	2 prs.		Basketball Goals and Back Stops	94	94	94						
	1		Piano	285	400	600						
	3		Bar Stall Benches	16	24	24						
			Total Minimum	971	1250	1590						
							971	1250	1590			
	1		Instructor's Platform				60	60	60			
	2		Climbing Ropes				24	24	24			
	1 pr.		Basketball Goals				7	7	7			
	1 pr.		Basketball Back Stops				40	40	40			
	1		Adj. Ladder				72	104	104			
	2		Stall Bars				32	32	32			
	2		Bars Stall Benches				11	16	16			
	1		Steel Cabinet				16	23	26			
	1 pr.		Flying Rings				20	20	20			
	1 pr.		Parallel Bars - adj.				152	152	152			
	4		Mats				76	76	76			
			Total Standard				1482	1805	2148	1482	1805	2148
	4		Climbing Poles							25	25	25
	2		Climbing Ropes							24	24	24
	1 pr.		Flying Rings							20	20	24
	5		Traveling Rings							56	56	56
	4		Balancing Beams							32	32	32
	1		Counterbalanced Swinging Boom and 2 Boom Saddles							200	200	200
	5		Stall Bars							80	80	80
	5		Stall Benches							28	40	40
	1		Massage Plinth							48	48	48
			Total Maximum							1995	2330	2673
			Total	971	1250	1590	1482	1805	2148	1995	2330	2673
			30 pupils in class									
			Cost per pupil station	32.36	41.67	53.00	49.40	60.17	71.60	66.50	77.67	89.10
			Index number	2.425	3.123	3.973	3.703	4.510	5.367	4.985	5.823	6.680
			Total	971	1250	1590	1482	1805	2148	1995	2330	2673
			40 pupils in class									
			Cost per pupil station	24.28	31.25	39.75	37.05	45.12	53.70	49.87	58.25	66.83
			Index number	1.826	2.342	2.979	2.777	3.380	4.025	3.739	4.368	5.010
			Total	971	1250	1590	1482	1805	2148	1995	2330	2673
			50 pupils in class									
			Cost per pupil station	19.42	25.00	31.80	29.64	36.10	42.96	39.90	46.60	53.46
			Index number	1.455	1.874	2.333	2.222	2.706	3.220	2.991	3.494	4.008
			Total	971	1250	1590	1482	1805	2148	1995	2330	2673
			60 pupils in class									
			Cost per pupil station	16.18	20.83	26.50	24.70	30.08	35.80	33.25	38.83	44.55
			Index number	1.212	1.561	1.986	1.851	2.254	2.683	2.493	2.911	3.340

TABLE 8

TOPIC BOYS' GYMNASIUM

TABULATION SHEET

Item #	Quantity	Stock #		Column # 1 Minimum: Economy	Column # 1 Minimum: Average	Column # 1 Minimum: Superior	Column # 2 Standard: Economy	Column # 2 Standard: Average	Column # 2 Standard: Superior	Column # 3 Maximum: Economy	Column # 3 Maximum: Average	Column # 3 Maximum: Superior
1	1		Horse	78.00	100.00	180.00						
2	1		Buck	45.00	60.00	100.00						
3	1		Parallel Bar Adj.	48.00	72.00	150.00						
4	1		Horizontal Bar	36.00	52.00	120.00						
5	2		Climbing Ropes	24.00	24.00	24.00						
6	1		Spring Board	32.00	40.00	60.00						
7	1 pr.		Jump Standards	16.00	16.00	40.00						
8	1 doz.		Jump Sticks	2.21	2.21	2.21						
9	6		Mats 2" x 4' x 6'	115.00	115.00	115.00						
10	2		Medicine Balls 6# - 8#	21.00	21.00	21.00						
11	1		8# Indoor Shot	11.00	11.00	11.00						
12	1		8# Outdoor Shot	3.00	3.00	3.00						
13	1		Volley Ball Outfit	21.00	21.00	21.00						
14	2 pr.		Basketball Goals	14.00	14.00	14.00						
15	2 pr.		Back Stops	80.00	80.00	80.00						
16	1 pr.		Vaulting Standards	16.00	40.00	40.00						
17			Total Minimum	564.71	673.71	983.71						
18							564.71	673.71	983.71			
19	1		Low Parallel Bar #483				22.00	22.00	22.00			
20	2		Beat Boards #925				16.00	40.00	40.00			
21	4		2" x 4' x 6' Mats				76.00	76.00	76.00			
22	1		Mat Truck				28.00	28.00	28.00			
23	1		Flying Rings #830				20.00	20.00	20.00			
24	1 pr.		Basketball Goals				7.00	7.00	7.00			
25	1		Horizontal Bar				36.00	36.00	36.00			
26	1 pr.		Back Stops				40.00	40.00	40.00			
27			Total Standard				810.71	945.71	1253.71			
28										810.71	943.71	1253.71
29	1		Vaulting Buck 305							45.00	45.00	45.00
30	10		Bar Stall Sections							160.00	160.00	160.00
31	10		Bar Stall Benches							56.00	80.00	80.00
32	1		Wrestling Mat 16' x 16(x 2"							200.00	200.00	200.00
	5		Traveling Rugs							56.00	56.00	56.00
	4		Climbing Ropes #797							48.00	48.00	48.00
	4		Climbing Poles							25.00	25.00	25.00
	1		Striking Bag Platform #17							72.00	72.00	72.00
	1		Vaulting Trough #918							20.00	20.00	20.00
	50 prs.		Indian Clubs, Maple							80.00	80.00	80.00
	50 prs.		Dumb Bells, Maple							100.00	100.00	100.00
	1		Instructor's Platform							60.00	60.00	60.00
			Total Maximum							1733.71	1890.71	2200.71

		Column # 1 Minimum: Economy	Average	Superior	Column # 2 Standard: Economy	Average	Superior	Column # 3 Maximum: Economy	Average	Superior
30 pupils in class	Total Cost	564.71	673.71	983.71	810.71	943.71	1253.71	1733.71	1890.71	2200.71
	Cost per pupil station	18.82	22.45	32.79	27.02	31.45	41.79	57.77	63.02	73.36
	Index number	1.411	1.683	2.458	2.025	2.358	3.133	4.331	4.723	5.498
40 pupils in class	Total Cost	564.71	673.71	983.71	810.71	943.71	1253.71	1733.71	1890.71	2200.71
	Cost per pupil station	14.11	16.84	24.59	20.26	23.59	31.34	43.33	47.25	55.01
	Index number	1.050	1.262	1.843	1.519	1.768	2.358	3.248	3.542	4.160
50 pupils in class	Total Cost	564.71	673.71	983.71	810.71	943.71	1253.71	1733.71	1890.71	2200.71
	Cost per pupil station	11.29	13.47	19.67	16.21	18.87	25.07	34.67	37.81	44.01
	Index number	.846	1.017	1.475	1.215	1.415	1.879	2.598	2.834	3.313
60 pupils in class	Total Cost	564.71	673.71	983.71	810.71	943.71	1253.71	1733.71	1890.71	2200.71
	Cost per pupil station	9.41	11.22	16.39	13.51	15.72	20.89	28.89	31.51	36.67
	Index number	.718	.841	1.229	1.013	1.179	1.566	2.165	2.361	2.749

TABLE 9

The Process of Estimating Costs

The following steps are necessary in estimating equipment costs for a proposed building:

1. Decide first on the number of each type of station to be provided, and the number of such stations per room; and, second, on the degree and quality of equipment.
2. Locate the index number representing your requirements in each case and multiply this index by the number of such stations.
3. Add together all these figures for all the types of station which include furniture only.
4. Add together the figures representing the stations equipped with machinery.
5. Multiply the sums obtained in steps 3 and 4 by $13.34. This will give the 1925 costs.
6. Convert the 1925 costs into present costs by using the present general furniture and machinery index numbers.

Some Typical Rooms Analyzed

The following tables are the results of an attempt to apply the idea outlined in the foregoing pages to a few of the more common types of pupil stations. The table of frequency for the occurrence of space provision in high school plans, as developed by Dr. Koos, was used as a rough guide to the selection of the typical rooms analyzed.

Rooms were selected which are common to a large percentage of high schools, rooms which represent a heavy financial investment, or rooms about which there seems to be little definite information as to pupil-station cost.

To arrive at the typical room set-up, Strayer and Engelhardt's High School Building Standards were consulted; the standard lists developed by some of the large schools were compared; actual inventories were made of equipment used in Muskegon and other West Michigan schools; the planning engineers of school equipment manufacturers were interviewed; and, lastly, the opinions of successful, experienced teachers were obtained.

The Equipment Included

It is to be expected that there will be a wide difference of opinion as to the necessity for, or desirability of, some of the equipment included in the various set-ups.

No attempt has been made to include any expendable supplies such as chemicals, glassware, basket-balls or the like. Neither has any of the smaller science apparatus been listed, as that varies greatly with the grade of work attempted, with the teacher, and with the text used. Clocks, telephones, radio speakers and the like are considered a part of the general service system.

The laboratory equipment listed on the science sheets carries the catalog number of the manufacturer whose equipment happened to be selected in trying out the method of estimating costs proposed in this article; the costs are at the 1930 level, and index numbers have not been computed. The prices quoted for all other equipment have been taken from the Loomis 1925 price lists, or are the prices actually paid in 1925.

A projection lantern has not been included in every science room, because it is general practice for several rooms to share the use of one lantern, each laboratory keeping its own supply of slides and projection material. In the same way it is customary for the various rooms in each academic department, or perhaps all the rooms of a small high school, to share the use of one lantern.

The Ratio of the Costs of Various Stations

The cost per pupil station in a recitation room seating 35 pupils, with standard equipment of average quality, worked out at $13.34. Taking this as a base, the ratio of the cost of other type stations is readily seen. For example, the cost per station in a physics laboratory seating 24 pupils, with standard equipment of average quality, is $87.92, or approximately 6.5 times as much. If maximum equipment of superior quality is used, the cost per station is $216.31, or approximately 16.2 times the cost of a recitation station.

The Proposed Plan Is Not Final

These tables are merely the beginning of this method of analyzing school equipment costs and are not submitted with the hope that they will be accepted without criticism. They represent, however, a fairly accurate analysis of the costs of the few types of stations considered.

The success of any such plan as this depends, of course, on developing typical room set-ups which would be generally accepted. It would require also that manufacturers and school authorities agree upon and understand the specifications for equipment listed at the three price levels. It would mean, in its final form, the setting-up of a testing laboratory in which the specifications for every piece of equipment listed on the typical room sheets would be determined.

Reducing Electricity Costs for Public Schools

BY H. H. LINN

ASSISTANT SUPERINTENDENT IN CHARGE OF BUSINESS, PUBLIC SCHOOLS OF MUSKEGON, MICH.

THE cost of electricity for public schools varies greatly throughout the United States, depending on the amount of power used and the cost per kilowatt-hour. The northern states, with less sunlight, and with shorter days in the winter, require more artificial light than the southern states. The standards of artificial lighting are higher in some cities than in others.* The educational programs differ also, some cities using much more electric power for vocational purposes than others. The cost per kwh. is ten times more for some communities than for others. In certain cities the public schools receive power from municipal plants without charge.

The only two ways in which schools can reduce the cost of electricity are:

1. To reduce the consumption of electricity
2. To reduce the cost per unit (kwh.)

Reducing the Consumption of Electricity

Without question, much electricity is wasted in our schools. Motors are often kept running when they could be cut off, and lights are left burning when not needed. If all school employees would cooperate to prevent the waste of power, a substantial saving would result. For example, during the school year 1929-1930 the records show that the school employees at Muskegon, Mich., saved the taxpayers approximately $2,000 by cutting off lights and motors when not needed. The annual expenditure for electricity for school purposes in this city amounts to approximately $14,000.

Standards Should Not Be Lowered

The elimination of waste in the use of electricity, however, does not imply that the standards of artificial lighting should be lowered so that the pupils will get less illumination than needed. As a matter of fact, the standards of artificial lighting in our public schools are in general too low, especially in the older buildings. Millions of school children are at present housed in buildings with inadequate and improper artificial lighting. It would be interesting to know how many pupils fail in their studies, how many headaches are caused, how many eyes are ruined and how much money is spent for glasses as a result of present inadequate or faulty school lighting. It would also be instructive to know what increase in learning could be achieved with better lighting conditions. While money may be saved by eliminating needless waste of electricity, probably far more should be spent to improve present artificial lighting in public schools.

Reducing Rates

It is not a simple matter to effect a reduction in rates paid for electricity used by schools. In the case of municipal power plants, the money, so far as taxpayers are concerned, goes from one pocket into another. It is not always an easy matter to get support for lower rates when they appear higher than is reasonable. In many instances the municipal rates are already low enough to be fair, and there is no need to get a further reduction.

It is also a difficult matter to get private utilities to reduce their rates for schools. These utilities are under the supervision of a state utility commission in practically all the states. Where a private utility extends its services over a number of communities within a state, the state commission supervises rates so that comparable consumers are given the same treatment under similar conditions. If a utility reduces the school rate in one community, it must do so for all the schools in the entire area served within the state, where conditions are similar. For this reason the private utilities serving a number of communities look with disfavor upon any suggestion that rates should be lowered. It is also quite natural for the utilities to desire to keep the rates up in order to make a greater profit.

Schools May Generate Own Electricity

In a number of cities the school authorities have attempted to reduce the cost of electricity by generating their own power in school-owned power plants.* Under certain conditions this practice may be advisable, especially if the schools use a considerable amount of power at a single point and if the rates charged by the utilities are rather high.

In the northern states particularly, school heating plants function throughout most of the school year. The majority of these schools are heated by steam. With the proper type of heating equipment it is possible to have the steam from the boilers first run a power generator and then have the steam exhausted into the heating system for heat. In other words, the same steam, with some loss, can be used both for generating power and heat.

* For a discussion of standards, see pages 59-64, THE AMERICAN SCHOOL AND UNIVERSITY, Edition of 1930-1931.

* The school-owned power plant refers to a power unit provided for a single building or for a group of closely connected buildings that could be served by a single plant. It does not refer to a big central power plant with distributing lines to all schools throughout a city.

There is in general a high correlation between the amount of heat and the amount of electricity required for schools. In winter, the days are shorter. More artificial lighting is needed during this season, and more heat is also required. During the summer months no heat is needed, and at the same time there is little use for electricity. When conditions are such that practically all of the steam required to operate a power unit can be exhausted into the heating system, comparatively little extra fuel is required. Hence, the power may be considered, in a sense, a by-product.

Factors to Consider in Estimating Costs

No general rule can be stated for determining whether or not a school should generate its own electric power. Each case must be considered separately. A number of factors must be studied in each case before a definite conclusion may be reached. It costs money to operate a school-owned plant, even though the steam may be a by-product of the heating plant. The following items must be considered in estimating the cost of generating electricity:

1. Interest on the initial cost of installing the electrical power unit and equipment, and of providing the necessary space for it.
2. Depreciation on electrical equipment and the space provided for it.
3. Fuel. (Even if all the steam is exhausted into the heating system, there is some loss, which must be charged against the power plant.)
4. Extra labor—if any.
5. General repairs and maintenance.
6. Water, oil, packing, etc.
7. Insurance.

The Amount of Electricity Used Must Be Known

In order to determine whether or not a school should operate its own power plant, it is necessary to know approximately how much electricity is used during the course of the year and what it costs. It is also necessary to know the peak load of electricity used by the school at any one time in order to ascertain the size of generator required if a school-owned plant were to be installed. The cost of installing the proper-sized plant with all other necessary equipment should then be estimated, as interest and depreciation must be charged against this initial cost.

A school-owned power plant is bound to require some additional fuel, even though most of the time the steam is exhausted from the generator into the heating system. A competent engineer, with the proper steam-flow records and electrical demand charts before him, can estimate the amount of extra fuel required to operate the plant.

Maintenance Questions Which Arise

How much, if any, additional labor will be required to operate a school-owned plant depends on local conditions. A small plant may require no additional expense for labor, as the heating engineer can take care of the power unit in addition to firing the boilers. A large power unit running twenty-four hours daily may require extra help.

Any type of power plant will need repairs at times. Minor items of water, oil, packing, etc., must also be considered. All of these costs should be accounted for in determining whether or not the school should manufacture electricity for its own use.

The question also arises as to whether the school-owned plant should be operated twenty-four hours a day throughout the year, or during the heating season only, when the steam can be exhausted into the heating system. In the latter event, the school building must be connected with the local utility in order to have service when the school plant is not in operation. Which plan is the better depends on the local conditions and power rates, which should be studied carefully.

TABLE 1 *

COMPARISON BETWEEN THE COST OF ELECTRICITY FOR THE BURTON AND OTTAWA HILLS SCHOOLS AT GRAND RAPIDS, MICH., FOR 1927-1928

Name of School	*Burton*	*Ottawa Hills*
Power plant	Yes	No
Cube of building, cu. ft.	2,951,000	3,043,000
Tons of coal burned	1,031.54	1,089.85
Electric current generated, kwh.	61,260	0
Electric current purchased, kwh.	9,218	68,086
Total current used, kwh.	70,478	68,086
Cost of generating current	$1,595.74	0
Cost of purchasing current	$ 448.54	$3,730.56
Cost of generating current per kwh.	.026	
Cost of purchased current per kwh.	$ .0486	$ .0547
Total cost of current used	$2,044.28	$3,730.56
Total cost per kwh.	$ .0289	$ .0547

From the above it will be noticed that the Burton School used 1,392 kwh. more current than the Ottawa Hills School, and still made a saving of $1,676.28. At the same rate per kwh. for Burton School as was paid for Ottawa Hills, the current would have cost $3,847.10, so that the actual saving to the Board was $1,802.82, or about 46 per cent.

The cost of generating current is based on an installation cost of $11,363.00, including the cost of the engine and generator, switchboard panel, electric wiring to board, foundation, feed water heater, and building space occupied. The items of cost of operation include interest on the investment, depreciation, supplies and repairs, extra attendance and extra coal and water. This plant will pay for itself in six to seven years and should be good for at least 25 years.

When Should a School-owned Plant Be Installed?

As indicated above, it is difficult to say with any degree of assurance at just what point school authorities should consider the advisability of installing a school-owned power plant. The writer believes that it is scarcely practical to consider a school-owned plant unless at least $2,000 is paid a utility annually for power for any single unit or group of closely connected buildings. Naturally, the greater the amount of money spent for electricity, the greater is the

* Figures given through courtesy of William W. Bradfield, engineer for the Board of Education, Grand Rapids, Mich.

possible saving by installing a school-owned plant. Unless the savings are worthwhile, the project should be dropped. Public utility rates have dropped, on the average, over a period of years, and there is reason to believe that they will continue to drop lower in the future, as a result of the expansion and increased efficiency of the power industry. Unless, therefore, the school-owned plant means a material saving, it would appear inadvisable to invest a great deal of money in equipment which should last at least twenty years and which must be operated for a period of many years before .it will pay for itself.

To illustrate with a single case, the city of Grand Rapids, Mich., has five schools equipped with power plants, which, according to William W. Bradfield, engineer for the Board of Education, are generating power at approximately one-half the cost per kwh. charged by the local power company. Figures for two comparable schools in this city are presented in Table 1. One of the schools buys all the power from the local power company. The other school has a power unit but is hooked up with the power company and buys a part of the electricity used during vacations and at night when the school plant is not being operated.

It is impossible in an article as brief as this to go into any great amount of technical detail regarding the operation of school-owned power plants. The point is stressed, however, that in a number of cities the schools generate electricity for their own use at a substantial saving, and undoubtedly there are many other instances where such plants would be advisable.

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Learn what Car-Na-Var, the only scientific combination of VARNISH GUM and WAXES, will do for floors of wood, linoleum, terrazzo, tile, slate, concrete, mastic, cork, cement, etc. Read these 9 big advantages:

ALVERNIA HIGH SCHOOL (above), Chicago, reports: "We have been using Car-Na-Var for two years on both terrazzo and hard maple floors. Our experience has been that Car-Na-Var saves labor and material and gives the floors a beautiful lustre never before obtained."

(Right)—Car-Na-Var gives mirror-like finish to linoleum floors of **INDIANAPOLIS PUBLIC LIBRARY.** Now a simple nightly mopping keeps 50,000 square feet of battleship linoleum in excellent condition in spite of constant traffic.

A BEAUTIFUL FINISH THAT PROTECTS YOUR FLOOR

1. **BEAUTIFUL, LUSTROUS FINISH.** Car-na-Var readily responds to a brilliant, varnish-like polish. Comes in "Natural" and the following popular colors: Dark Oak, Light Oak, Mahogany, Walnut, Olive Green, Bright Green, Mission, Maroon and Cherry.
2. **IMPROVES WITH WEAR.** The friction of traffic enhances the polish. Keeps the Car-Na-Vared floor always lustrous.
3. **NON-SLIPPERY.** Car-Na-Vared floors are safe because they are non-slippery.
4. **SAVES YOUR FLOORS** by eliminating frequent scrubbing. Floors wear many years longer.

CUTS FLOOR MAINTENANCE COSTS IN HALF

5. **EASILY CLEANED.** A simple dry mopping replaces scrubbing. Saves time and labor.

6. **DURABLE.** Car-Na-Var wears 3 times as long as floor wax.
7. **REPAIRS DON'T SHOW OVERLAPS.** Worn spots repaired without showing overlaps.

EASY TO APPLY . . . READY IN AN HOUR

8. **APPLIED WITH A MOP.** Requires no experience.
9. **READY FOR TRAFFIC IN AN HOUR.** Car-Na-Var dries almost immediately.

(Above)—75-YEAR-OLD WOOD FLOORS AT ELMIRA COLLEGE, ELMIRA, NEW YORK, PRESERVED AND BEAUTIFIED WITH CAR-NA-VAR

NU-TRO-FIL

Neutralizer for free acid and alkali left by previous cleaners. For use in conditioning floors before applying Car-Na-Var. Serves as a filler and also a hardener for cement, terrazzo, etc.

DE-TER-GO

An oil and stain solvent, De-Ter-Go will readily recondition old, oil-soaked and stained floors. Also used in preparing floors for Rubber-Var.

RUBBER-VAR FOR TREATING RUBBER FLOORS

This floor treatment with the Car-Na-Var solid content is especially prepared for use on floors of rubber, light-colored terrazzo and soft composition. Recommended by the leading rubber companies for treating and protecting rubber floors. It is applied with a mop and responds to a hard, brilliant and waterproof finish.

CAPACITY CHART

Table showing the covering capacity of one gallon of Car-Na-Var.

Hard Wood (Unfilled)—3 coats
- 1st—900 to 1200 sq. ft.
- 2nd—1500 to 2500 sq. ft.
- 3rd—2500 to 3000 sq. ft.

Soft Wood (Unfilled), Terrazzo, Magnesite, Faience Tile, Flexstone, Linoleum, Marbleloid—3 coats
- 1st—800 to 1000 sq. ft.
- 2nd—1000 to 1500 sq. ft.
- 3rd—1500 to 2500 sq. ft.

Cork, Cement, Composition—3 coats
- 1st—500 to 1000 sq. ft.
- 2nd—800 to 1500 sq. ft.
- 3rd—1000 to 2500 sq. ft.

Mastic—2 coats
- 1st—900 to 1200 sq. ft.
- 2nd—2500 to 3000 sq. ft.

Painted, Varnished, Shellacked—1 coat
- 1st—2500 to 3000 sq. ft.

A PARTIAL LIST OF SCHOOLS AND COLLEGES USING CAR-NA-VAR OR RUBBER-VAR

Shorewood High School, Milwaukee, Wis.
St. John's High School, Brooklyn, N. Y.
Ft. Wayne Public Schools, Ft. Wayne, Ind.
Board of Education, Melvindale, Mich.
Public Schools, Alexandria, La.
Public Schools, Aurora, Ill.
Public Schools, Hastings, Nebr.
Public Schools, Indianapolis, Ind.
Public Schools, Hibbing, Minn.
Public Schools, Jacksonville, Ill.
Public Schools, West Milwaukee, Wis.
Public Schools, Muncie, Ind.
Public Schools, New Britain, Conn.
Public Schools, Pasadena, Calif.
Public Schools, Royal Oak, Mich.
Public Schools, Evanston, Ill.
Public Schools, Beverly Hills, Calif.
Public Schools, Hartford, Conn.
West Point (U. S.) Military Academy, West Point, N. Y.
Harvard University, Cambridge, Mass.
Institute of Musical Arts, New York, N. Y.
Pa. College for Women, Pittsburgh, Pa.
University of New Hampshire, Durham, N. H.
Dartmouth College, Hanover, N. H.
St. Catherine's School, Richmond, Va.
University of Arkansas, Fayetteville, Ark.
University of Michigan, Ann Arbor, Mich.
University of Notre Dame, South Bend, Ind.
Purdue University, LaFayette, Ind.
St. John's Military Academy, Delafield, Wis.
University of Southern California, Los Angeles, Calif.
University of Washington, Seattle, Wash.
Bellingham Normal School, Bellingham, Wash.
State Industrial Schools, Ogden, Utah
Centralia Jr. College, Centralia, Wash.
Williamette University, Salem, Ore.
Linnfield College, McMinnville, Ore.
Fordham University, Fordham Road, N. Y.
State Teacher's College, Kearney, Nebr.
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Almost 70 per cent of the schools and other public institutions of the country are using Holcomb Cleaning Tools.

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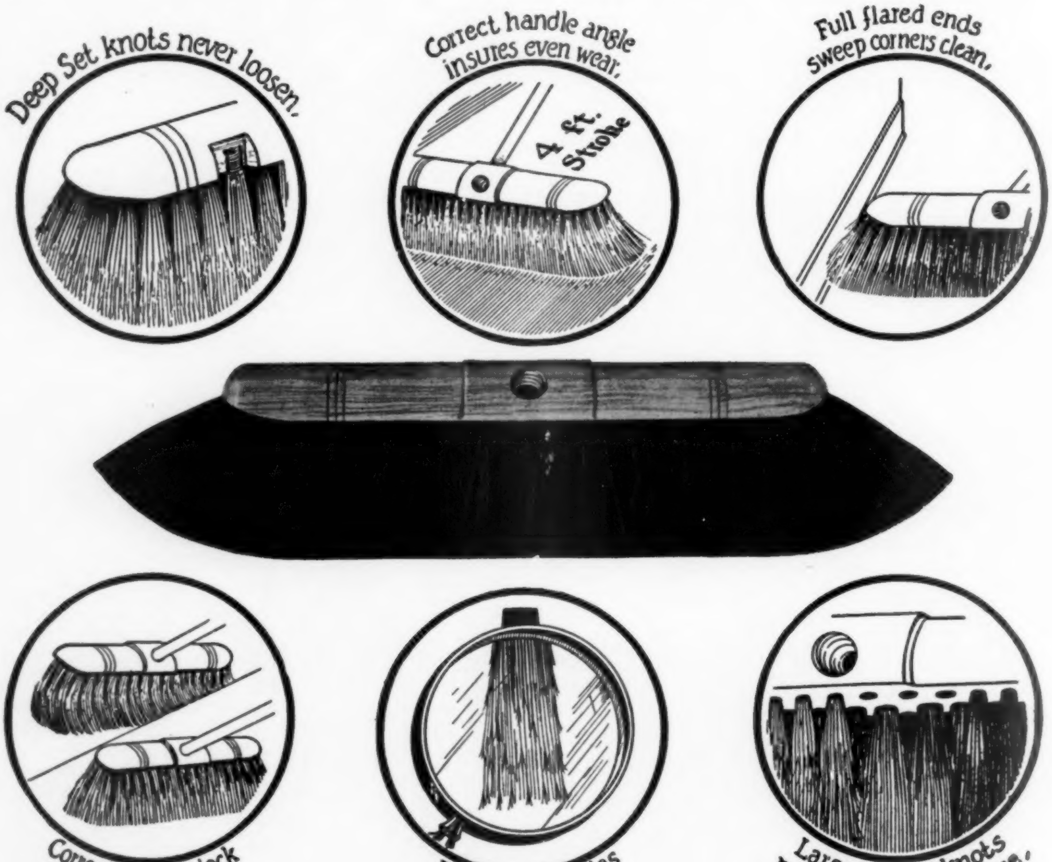
As labor takes 95 cents of your cleaning dollar you need the correct cleaning tools to reduce this cost. Only 5 cents is spent for supplies. Holcomb "tools" are the correct "tools" for the purpose.

Holcomb Floor Brushes

During four to five months of winter, sweeping-time, after the classrooms are



vacated, is limited. Holcomb Floor Brushes do the maximum sweeping per stroke with the minimum of labor. "Correct construction cuts cleaning costs"—by speeding up the job.

"To Thoroughly Clean, Use Puritine"

As a grease solvent and dirt remover, Puritine goes almost three times as far as most cleaning compounds. Puritine, a white crystal similar in appearance to granulated sugar, is completely soluble in either hot or cold water. It acts immediately, and is particularly recommended for large-scale cleaning.

Use Puritine on cement, linoleum, marble, rubber, terrazzo, tile or wood floors. One tablespoonful to a gallon of hot or cold water is the usual amount required.

Catalog

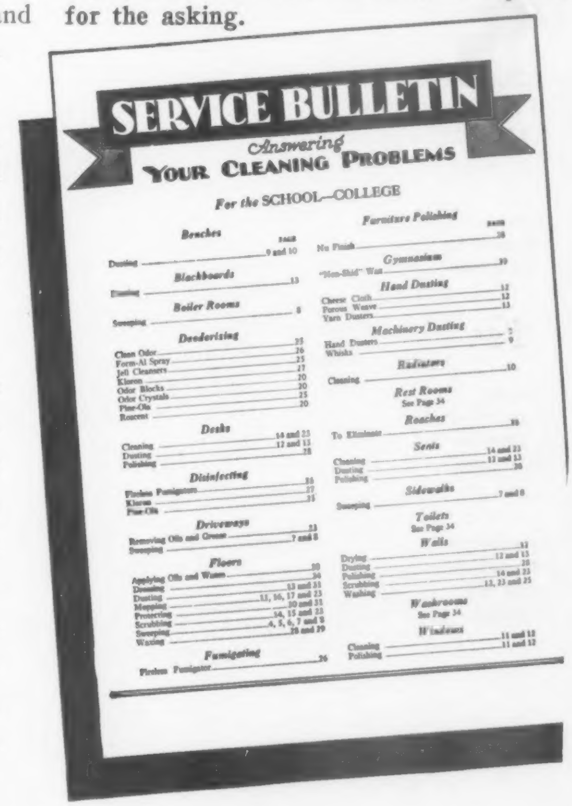
At the right is a reproduction of page 3 of our Catalog No. 61, which tells you about more than one hundred cleaning brushes and cleaning chemicals. This page is an index telling you just where to find the answer to any of your cleaning problems. Under each heading are reference numbers to the catalog pages on which may be found the various types of cleaning supplies needed for the particular job.

Disinfectants and Deodorants

At the right is pictured one of our Caged Odor Blocks (large size, 2½" by 7¾"). Attached to the wall, either horizontally or vertically, they cover objectionable odors, their rate of evaporation being regulated by the amount of waxed paper removed. A new cage is furnished with each block. Two colors: white and green; two odors, rose and flora.

Other disinfectants and deodorants are described in our Catalog No. 61.

A copy of Catalog No. 61 will be sent to any interested school executive—it's yours for the asking.



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Answering YOUR CLEANING PROBLEMS
For the SCHOOL—COLLEGE

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Here is the Silent Huntington Scrubbing and Polishing Machine—*the newest and latest product in floor scrubbing and polishing machines.* It is designed with so few working parts and is so substantially built, that it's *truly a life-time Scrubbing and Polishing Machine.* It operates so smoothly and is so easy to control that it's a pleasure to use it.

It does its work so quickly and thoroughly . . . *as a time-saver it is away ahead* of other scrubbing machines of similar dimensions. All who see and use this machine realize its unusual merits.

Specifications

Cast aluminum frame with wrought iron carriage.

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Fourteen-inch scrubbing and polishing brushes furnished with machine; also 50 feet heavy-duty, well insulated cord and connectors.

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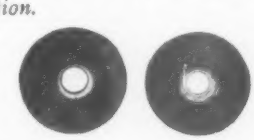

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Loyola College, Montreal, Que., Canada
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Board of Education, Aurora, Ill.
Board of Education, Pella, Iowa
Lawrence College, Appleton, Wis.
Iowa School for the Deaf, Council Bluffs, Iowa
Associated Students University of Calif., Berkeley, Calif.
Indiana University, Bloomington, Ind.
Board of Education, Shelby, N. C.
Chilocco Indian School, Chilocco, Okla.
Johns Hopkins University, Baltimore, Md.
Harvard University, Cambridge, Mass.
Washington State Normal School, Ellensburg, Wash.
University of Montana, Bozeman, Montana
State University, Norman, Okla.
Lehigh University, Bethlehem, Pa.
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- 1—No. 7A 10-inch Carpet and Floor Brush
- 1—No. 8 Utility Tool, for cleaning upholstery, shelves, machinery, etc.
- 1—No. 9A 15-foot length Hose (braided)
- 1—No. 12A Radiator Tool, flattened tube for cleaning machinery and inaccessible places
- 1—No. 15 Blower Tool, for blowing dirt out of radiators and other small inaccessible places
- 1—No. 16 Straight-Part Operator's Handle
- 1—No. 16A Curved-Part Operator's Handle
- 1—No. 17 Rubber Tufter, for renovating and cleaning upholstery, also along baseboards
- 1—No. 18 Hose and Tool Connector
- 1—No. 20 Exhaust Hose Connector (for Jumbo only)

SPECIFICATIONS

VACUNA "JUMBO"—Net weight of machine, 84 pounds; shipping weight, 190 pounds; height (overall), 36 inches; width, 23½ inches; ⅜-horsepower Universal motor in either 110 or 220 volts.

A dependable portable cleaner

Unusually powerful and large in capacity

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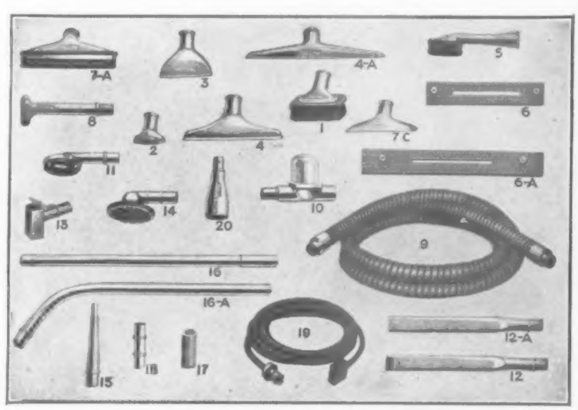
SPECIFICATIONS

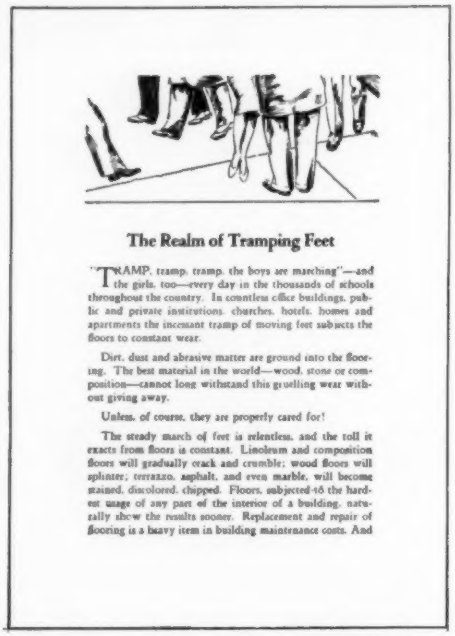
VACUNA "JUNIOR"—Net weight of machine, 52 pounds; shipping weight, 120 pounds; height (overall), 34 inches; width, 19 inches; ¼-horsepower Universal motor in either 110 or 220 volts.



MASURY-YOUNG COMPANY

76 Roland St., Boston, Mass.

TIDY HOUSE, the new Masury-Young Cleaning Manual



The Realm of Tramping Feet

"TRAMP, tramp, tramp, the boys are marching"—and the girls, too—every day in the thousands of schools throughout the country. In countless office buildings, public and private institutions, churches, hotels, homes and apartments the incessant tramp of moving feet subjects the floors to constant wear.

Dirt, dust and abrasive matter are ground into the flooring. The best material in the world—wood, stone or composition—cannot long withstand this gruelling wear without giving away.

Unless, of course, they are properly cared for!

The steady march of feet is relentless, and the toll it exacts from floors is constant. Linoleum and composition floors will gradually crack and crumble; wood floors will splinter; terrazzo, asphalt, and even marble, will become stained, discolored, chipped. Floors, subjected to the hardest usage of any part of the interior of a building, naturally show the results sooner. Replacement and repair of flooring is a heavy item in building maintenance costs. And

ONE PAGE OF TIDY HOUSE, MASURY-YOUNG'S CLEANING MANUAL

For nearly three-quarters of a century Masury-Young Company has served leading American colleges, schools, universities, hospitals, office and apartment buildings and public and private institutions with cleaning materials and equipment. During that time we have had many cleaning problems brought to us.

Now we have put the knowledge of all of our years of experience in one Cleaning Manual—TIDY HOUSE. No matter what type of flooring you have—whether it is linoleum, composition, wood, terrazzo, asphalt, tile or marble—you will find TIDY HOUSE a valuable guide to floor cleaning and preservation.

It is yours for the asking. Simply write to Masury-Young Company, 76 Roland Street, Boston, Mass., and your copy will be forwarded to you immediately, without obligation.

Write to Masury-Young's Service Bureau for Help on Your Building Maintenance Problems

MASURY-YOUNG COMPANY

76 Roland St., Boston, Mass.

CATALOG NO. 73, the Cleaner's Encyclopedia

Masury-Young's new Catalog has been called the "Cleaner's Encyclopedia." It is that and more. In its sixty-four pages will be found descriptions and illustrations of all the materials and equipment necessary for complete building maintenance.

They are MYCO Products, tested by Masury-Young's staff of chemists, approved by thousands of users everywhere, and backed by the famous Masury-Young "Money-Back" Guarantee.

Every school and college superintendent and janitor should have a copy of this catalog. Without it you cannot possibly get the satisfactory and economical materials your school deserves. Send for a free copy today.


BETTER BUILDING-MAINTENANCE *and* SANITARY SUPPLIES

No. 200
Mycoleum
Cleaner, Polisher, Preserver and Deodorizer — all in one

This picture tells the story where Mycoleum is used and where it is not. Linoleum floors cost money — protect them — the cost of Mycoleum is so small you can't notice it. Also used on all other types of floors; and on Furniture and Woodwork.

Mycoleum cleans, polishes, preserves the lustre of the finish and deodorizes at the same time. Brings a satin finish that lasts. Unequaled in efficiency. Used on Linoleum, Composition, Wood, Painted, Tile, Cement and all other types of floors. Approved by Armstrong Cork Company and other leading manufacturers of composition floors. An ideal cleaner and polisher for Furniture, Woodwork, and Autos.

Keeps new Linoleum resilient and capable of withstanding hard usage. Brings back life to Linoleum which is cracking, chipping or generally showing signs of wear. Absolutely pure. Dissolves in water quickly and thoroughly. Free from ruinous caustics or alkalies. Will not injure the most delicate finish. Easy to use, little rubbing. Sold in 55, 30, and 15-gal. drums, 10 and 1-gal. cans and 1-lb. glass jars.

No. 201
Myco Hard Oil Soap

Used for cleaning and polishing furniture, hardwood, linoleum, tile and mosaic tile floors. A pure linseed potash soap, and neutral. Dissolve thoroughly a quarter pound to a pail of water and apply. Rinse with clean water and polish with chamois or cheesecloth. Sold in 400-lb. and 110-lb. barrels, 75-lb. kegs and 25-lb., 10-lb. and 1-lb. pails.

No. 202
Myco Oil Soap

Myco Hard Oil Soap is an extremely hard green oil soap. Made entirely of olive and other vegetable oils. It absolutely neutral and can be used on the finest finishes with complete safety. Sold in 400-lb. and 110-lb. barrels, 75-lb. kegs and 25-lb., 10-lb. and 1-lb. pails.

Page Four

A PAGE FROM MYCO CATALOG, THE CLEANER'S ENCYCLOPEDIA

Write to Masury-Young's Service Bureau for Help on Your Building Maintenance Problems

THE FAY COMPANY

128–130 Madison Ave., New York, N. Y.

FAY
Electric Floor MACHINES

For School Floors

FAY Electric Floor Machines are ideal for all school uses, as they are all-purpose machines having interchangeable attachments making them instantly adaptable for every sort of floor work on every type of floor. Each machine not only **scrubs** and **cleans, waxes** and **polishes,** but also refinishes and sandpapers. The FAY is easily operated. Just plug it into any electrical outlet, and under guidance of the simplest sort it does its work powerfully, inexpensively and thoroughly—doing the work of from five to fifteen men, more thoroughly and at less cost.

For scrubbing and cleaning—the FAY digs into the pores and produces a spotless job. The rapidly revolving brush under heavy pressure removes all dirt, grease, oil and discoloration from the pores and tiny crevices. The FAY gives maximum satisfaction at minimum cost.

For waxing and polishing—Floors in schools and administration buildings can be maintained most efficiently and economically by waxing and polishing. For this work the Fay should be used so that the wax will be properly rubbed into the surface of the linoleum, wood, composition or terrazzo floors. A rich, glossy finish will be produced by polishing with the Fay machine.

PRODUCTS

FAY Electric Floor Machines in two models—Champion (55 pounds pressure on the floor) and Jumbo (120 pounds pressure); **FAY Attachments** for cleaning, waxing, polishing, sandpapering, refinishing; and **FAY Liquid Cleaner, FAY Liquid Wax, etc.**

JUMBO MODEL

Service

We shall be glad to demonstrate the use of our machines on your school floors in order to prove conclusively that the FAY-WAY is the best way. Just advise us of the kind of floors to be treated, and we will do the rest.

Free Trial Offer

Where it is impossible to make a personal demonstration, we shall be glad to forward a machine for free trial on conditions to be furnished on written request.

HILLYARD CHEMICAL COMPANY

EXECUTIVE OFFICES AND FACTORY

St. Joseph, Missouri, U. S. A.

Branch Offices and Warehouse Stocks in All Principal Cities

Shine-All

Trade-Mark Reg.

Shine-All is the one cleaner which meets the requirements of all types of floor surfaces—either rigid or resilient.

Shine-All is the efficient neutral cleaner free from alkali, ammonia, lye and harmful abrasives . . . it cleans, polishes and preserves in one operation . . . saving time and labor costs.

Floor Maintenance Consultants

Every Hillyard Floor Maintenance Engineer has a practical working knowledge of the care and treatment of all types of floors.

His services are yours for the asking. A consultation will gladly be arranged without the slightest obligation to you.

Hillyard Helps

"Modern Floors—Their Maintenance" is a treatise published by the Hillyard Chemical Company with the cooperation of leading floor manufacturers. "Sanitation of Today" describes the entire Hillyard line. Write for your copies.

Hiltonian

Trade-Mark Reg.

Scrubbing and Waxing Machine

A sturdily built electric floor machine for scrubbing, waxing and polishing all types of floors. The simple construction gives perfect scrubbing action and ease of operation.

Special Gymnasium Floor Finish

Produces non-slippery, durable and sanitary floor, easy to maintain. Withstands hard and constant wear—insures a perfect non-slippery surface for rubber-soled shoes—universally used by leading schools, universities and athletic clubs.

TWO SIZES
"SENIOR"
20-inch scrubbing surface
"JUNIOR"
15-inch scrubbing surface

Onex Seal

ONEX
TRADE MARK REG.
SEAL

A proved seal and finish for all fine floors, including tile, marble, terrazzo, flexotile and slate! One coat seals, two coats seal and polish and give an attractive, lustrous finish that will protect and beautify the surface. Ask a Hillyard Maintenance Engineer for more details concerning this wonderful new product.

Diamond Floor Finish

Trade-Mark Reg. U. S. Pat. Off.

A splendid finish for wood, linoleum and cork carpet—tough, lustrous and quick drying. Easy to apply, Diamond Floor Finish is just another step forward in our complete floor maintenance service.

Hillyard Wood Primer

The perfect foundation for all finishes and dressings. Uniform results obtained on large areas, quickly and economically. Preserves the original color of the wood.

Neutone Floor Dressing

Trade-Mark Reg. U. S. Pat. Off.

The perfect dressing for wood floors. Replaces the oil and greasy types of floor dressing.

Neutone produces a hard, firm, lustrous finish which will not collect dirt or become discolored from traffic.

Trackless Floor Dressing

Trade-Mark Reg. U. S. Pat. Off.

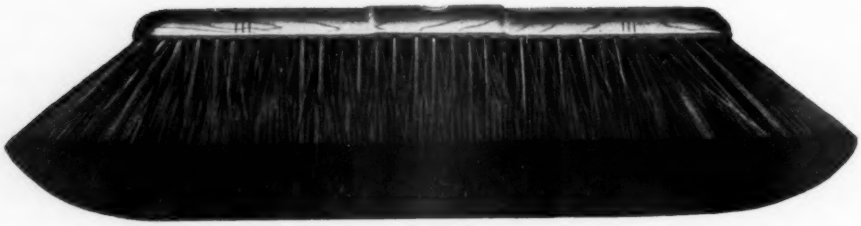
Three important functions in wood floor treatment are accomplished economically with "Trackless":

1. Clears away surface grime and dirt
2. Leaves a secure filling and sealing coat
3. Gives a lustrous finish extremely easy to keep clean and sanitary

M. W. JENKINS SONS, INC.

Brush Manufacturers

Cedar Grove, Essex County, N. J.



JENKINS BRISTLE BROOM
Hair out of Block 4¼″

JENKINS FLOOR BROOMS ESPECIALLY RECOMMENDED FOR SCHOOLS

Especially recommended for school use are the Jenkins quality brooms pictured on this page. These brooms are made of the very finest quality of gray Russian bristles, together with a small portion of horse hair. Experience has shown us that these materials will render a much longer service than brooms of tampico fibre, horse hair and bristle. Generally speaking, cheapness in price will be found to mean cheapness in quality as well, and consequently shorter and less dependable service. Jenkins quality brooms are always the most economical in the end, for they produce better results over a longer period than would be possible for a product of inferior quality.

Fifty-four years of experience in producing a varied line of quality brushes for a multitude of purposes are responsible for the present superiority of Jenkins' products. Since 1877, the date of the establishment of the business of M. W. Jenkins Sons, it has been the continual aim of this concern to produce, not merely brushes, but the **finest** brushes.

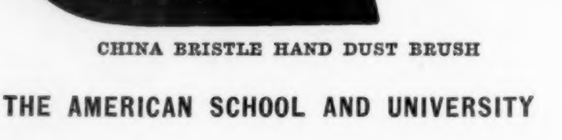
A conscientious attention to the achievement of this ideal, plus the use of the finest materials, and the most highly skilled labor, have resulted in a national reputation for quality.

E. O. BRISTLE BROOM
Hair out of Block 4″

There's a Jenkins Brush for Every Need

Jenkins Floor Brooms are made in a variety of sizes from 10 inches to 42 inches long, but we can also make up any kind of a brush or broom in accordance with your specifications. If a cheaper broom is required for sidewalks, we can supply a palmetto fibre broom in sizes from 12 inches to 42 inches long.

The Jenkins Brush has made good since 1877



CHINA BRISTLE HAND DUST BRUSH

PORTER-CABLE-HUTCHINSON CORP.

1818 No. Salina St., Syracuse, N. Y.

PORTER-CABLE
SANDERS

THE MOST WIDELY USED IN THE WORLD

TAKE-ABOUT Sander

Hundreds of schools have found the TAKE-ABOUT Sander has saved many dollars in refinishing old desks, tables, woodwork and slate blackboards. This tool, in the hands of your maintenance man, can show you savings hitherto impossible by any other method. The smooth and speedy action of the abrasive belt quickly re-

moves the old varnish, scratches and gouges, giving the desk a new appearance. Compare the belt speed of 1600 feet per minute with a man sanding by hand and it is easily visualized how quickly a desk can be refinished.

By merely using a different abrasive, slate blackboards can be renewed and joints evened up with the TAKE-ABOUT Sander. It doesn't take many feet of blackboard before the TAKE-ABOUT pays for itself.

When the refinishing work is done, put this tool in your manual training shop where it stimulates interest and

desire for better workmanship. Eliminates tedious, uninstructive handsanding. Four sizes. Send for free bulletin.

Speedmatic

Floor Surfacer

A light, fast, one-man sander for surfacing all types of school floors. Many worn floors are replaced in schools that could be quickly leveled and resurfaced economically with the SPEEDMATIC. Many schools and col-

leges find this machine reduces their maintenance costs materially. The SPEEDMATIC has a patented construction, all ball-bearing, dustless and easy to operate. Unusually light in weight, your maintenance department will delight in its use and the speed at which it refinishes floors. Two models. Ask for interesting bulletin.

Band Saw

PORTER-CABLE-HUTCHINSON also offers a complete line of woodworking machines for the manual training shop, such as Band Saws, Bench and Table Saws, Jointers and Shapers. Illustrated is an all ball-bearing, precision-made 16-inch Band Saw, specially guarded for school use.

Disc Sander

Type D-1 Disc Sander, illustrated, is the pioneer of all dustless, motor-driven disc sanders. Standard among schools and pattern shops. Compound angles quickly secured. Table lowers so full use of disc with table can be obtained. Also Belt and Spindle Sanders. Ask about them.

SCOTT PAPER COMPANY

Manufacturers of

TISSUE TOWELS AND TOILET TISSUES

Chester, Pennsylvania

DISTRIBUTORS IN ALL LARGE CITIES

Thirsty Fibre Towels packed 150 to the carton, 25 cartons to the case

Attractive towel cabinet at left—white or olive green — holds 250 towels

Thirsty Fibre Towels

Scott Thirsty Fibre Towel service provides you a constant supply of fresh, clean, individual towels.

It saves you money, too. Waldorf Towels cost only $1.75 per person per year. ScotTissue Towels cost very little more.

Either is more economical than adequate cloth towel service.

More economical than ordinary paper towels, too. They're actually 10 times more absorbent—because of the "thirsty fibres" and the special double fold. They're softer, too, and strong even when wet. Send for a free sample carton of ScotTissue or Waldorf Towels. No obligation.

ScotTissue Service Roll

Specially packed for large consumers, ScotTissue actually costs less than so-called "cheap" toilet tissues.

It's scientifically processed to satisfy strictest medical requirements.

Many institutions in all parts of the United States are installing it because they find it both safer and more economical than coarse, inferior tissues.

Each roll of ScotTissue contains 1000 sheets with clean-cut perforations which tear easily and evenly. One hundred rolls are packed per case

THE SPENCER TURBINE CO.

HARTFORD, CONNECTICUT

THE SPENCER SYSTEM OF VACUUM CLEANING

The Spencer Multistage Turbine System of Vacuum Cleaning has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Cleaner Schools—For school buildings, the Spencer System has introduced a new standard of cleanliness. Numerous tests have demonstrated that the Spencer System removes 25 to 50 per cent more dirt in pounds under similar conditions than other methods.

No Dust—The Spencer System removes dangerous dust. Even the finest dust is drawn in by large volumes of air under heavy vacuum and goes down to a container in the basement.

Speed—The Spencer System saves time. The Spencer System usually shows a saving of 20 to 30 per cent of the operator's time on bare floors. In cleaning other parts of the school building, however, such as rugs, walls, chalk trays, etc., there can be no comparison. If the janitor were to attempt to clean these parts as well as the Spencer System does, it would require two to ten times as much work!

For Cleaning Erasers and Chalk Trays—The Spencer System, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of the eraser or the chalk tray.

Cleans the Boiler Room—This system cleans boiler room floors—removes dust and soot from pipes and draws soot out of the boiler tubes, often saving the whole cost of operation in this one item alone.

BOOKLET

A number of Spencer-cleaned schools are illustrated in our booklet. A copy of the booklet and a complete list of Spencer-cleaned schools will be sent on request.

CLEANING CLASS-ROOM FLOORS

CLEANING ERASERS

5835

THE TROPICAL PAINT & OIL COMPANY

General Offices and Factories

1208-1250 West 70th St., Cleveland, Ohio

TROPICAL

Special Paints for Schools

For years we have specialized in the manufacture of Paints, Enamels, Varnishes and Roof Coatings for the protection of large buildings. During this time we have developed many coatings for educational institutions.

Our whole energy is bent toward the improvement and development of our maintenance products. It pays to buy from specialists like ourselves, because you are sure of getting the most suitable coating for every surface and one which will give long wear and satisfaction.

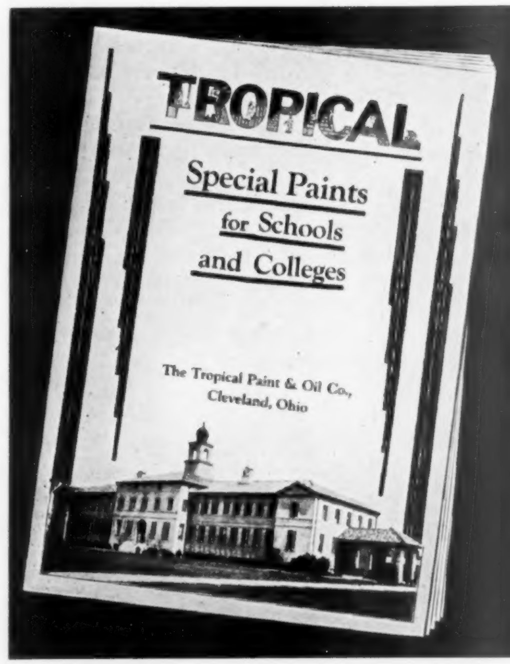
The Tropical Surface Saver

From an advertisement in *The Saturday Evening Post.*

We maintain a staff of men covering the whole country, who are known as "Tropical Surface Savers." They have been trained in paints and painting problems and know how to analyze painting conditions.

The "Tropical Surface Saver" in your locality will be glad to apply his knowledge to your problems. This is a service of which you can avail yourself free of charge.

Book Sent Free to School Officials



The book pictured here is given free to school officials. It was designed especially to help those who are responsible for the maintenance and upkeep of school buildings.

In its pages you will find information about protecting and decorating difficult surfaces like swimming pools, shower rooms, laboratories and toilet rooms. It also contains pictures of many educational institutions where Tropical Protective Coatings are now in use, and descriptions of those products, which are designed for school buildings.

Another useful feature of this book is an alphabetical index of all surfaces that need protection around educational institutions, and opposite each is the name of the Tropical Product that is designed to decorate and protect that particular surface.

This book will make a valuable addition to your information file. A copy will be sent free on request.

Section IV

THE PLANNING AND LANDSCAPING OF SCHOOL GROUNDS

Planning and Planting School Grounds

BY CARL F. PILAT
FELLOW, AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS

THE value of pleasant landscape setting for educational buildings, in keeping with the dignity and importance of educational work, is beginning to be appreciated by public schools as well as by universities and private schools. The movement for more inviting school grounds is becoming nation-wide and it is one of the finest features of our present-day life. It is part of the general recognition of the beneficial effects of good environment upon children and young people in promoting the self-respect and the respect for society that are essential to good citizenship.

The day of barren grounds and unsightliness has definitely passed. Even small communities are recognizing the need for at least a modicum of landscape treatment about their schools. Such developments are not necessarily costly or elaborate, and they should not as a rule be pretentious or markedly formal.

Simple Landscaping for Small Grounds

When there is little space around a school building, the landscape treatment may consist of nothing but a smooth lawn, a few well-chosen and well-placed trees and shrubs, and some flowers to brighten the lawn. Though the school may not be in use during the summer months, the grounds are seen all the time, and they can convey an impression of beauty and attractiveness which

Roy Seldon Price, Edward Cray Taylor and Ellis Wing Taylor, Associated Architects

TWO VIEWS OF THE HORACE MANN SCHOOL, BEVERLY HILLS, CALIF.
The planting of suitable trees and shrubs near the building unites it with the landscape and decorates the walls with shadows. (For another view of this school, see page 302.)

A SIDE ENTRANCE OF THE JEFFERSON SCHOOL
Informal planting close to the building gives it a friendly air

will have a favorable effect upon the children, their parents and the community generally. Public schools should express in their surroundings the orderliness, love of beauty and cheerfulness that are among the aims of education.

Play Fields and School Gardens

Facilities for healthful recreation and athletics, now recognized as having an important bearing upon pupils' school work and upon their usefulness and happiness in adult life, call for extended grounds area.* When this area can be added to the school grounds, it enlarges the open space about the building and increases the opportunity for effective landscape treatment. Of course, in some instances sufficient land for these purposes cannot well be provided adjoining the school, and the requirements must be met by an athletic field and recreation grounds at some distance. When possible, school gardens, in which pupils plant and cultivate vegetables and flowers, should also be in close proximity to the school building. By good planning and the proper planting of trees and shrubs

* The planning of playgrounds is discussed by Dr. Ernst Hermann on pages 231-233.

Brinley & Holbrook, Landscape Architects, New York City

THE PLEASANTLY INFORMAL SURROUNDINGS OF THE JEFFERSON SCHOOL, MAPLEWOOD, N. J.

around them, these gardens can add to the attractiveness of the grounds.

The landscape development of school grounds, in addition to creating orderly, convenient and attractive surroundings, should provide opportunities for the study of botany, gardening and the culture of trees, shrubs and flowers. There is a need for more general instruction in such subjects as plant pathology, entomology, agricultural chemistry and allied subjects, in order to arouse an interest in horticulture and forestry, as occupations and to provide a basis for specialization along these lines. Every school garden should at least contain representative trees, shrubs and flowers, labeled with both botanical and common names, so that the students will become familiar with them.

Parks Adjoining School Grounds

Until quite recently, public parks and public school buildings have too often been located without any reference to each other. In the vast majority of instances, only private residences have enjoyed the advantages of frontage on a park. Public schools have been crowded in among buildings, often with nothing better than a cement yard for grounds and a brick wall for an outlook. Now, however, it is becoming usual for municipalities to allot to the park authorities a portion of the land adjoining a new school site, thereby giving the school the benefit of a park as a part of its setting, and adding practically the area of the school property to that of the park. This arrangement is much more desirable than having parks and school grounds unrelated to each other.

Combining Athletic Fields and Parks

When it is not practicable to place the athletic field and play field in the immediate neighborhood of the school building, it is often desirable to combine these features with a public park, as shown by the plan of Riverside Park and Athletic Field at Bogota, N. J. The area of the tract is approximately twenty acres, of which about six acres in the northeasterly corner have been conveyed to the Board of Education, in order that they may be under the administrative control of that body and used for athletic activities. The space and facilities of the athletic field may be used by the public or by organiza-

Ralph Harrington Doane, Architect, Boston, Mass.

FINE TREES AND A LAWN DISTINGUISH THE HIGH SCHOOL AT SHARON, MASS.

Marjorie Sewell Cautley, Landscape Architect, Ridgewood, N. J.

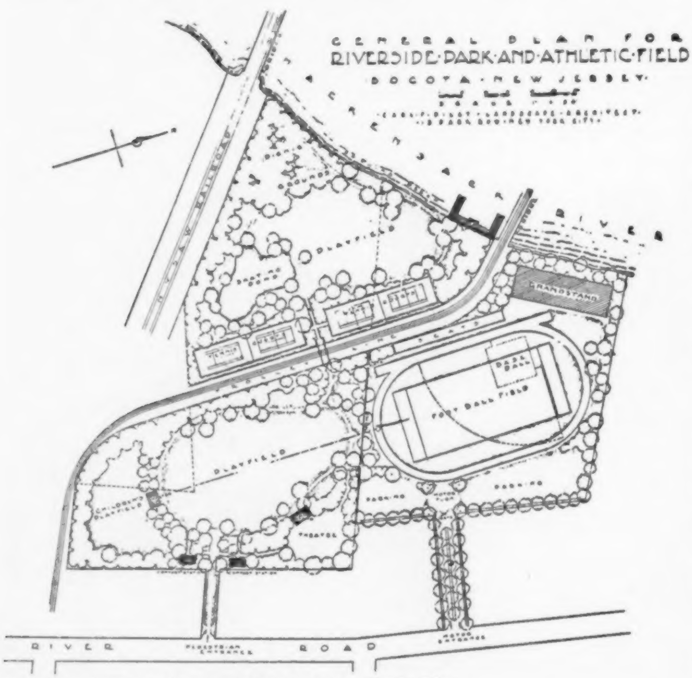
THE BOARD OF EDUCATION SKATING POND ON ROOSEVELT COMMON, TENAFLY, N. J.

tions, with permission from, and under the supervision of, the Board of Education. The remainder of the property, about fourteen acres, is devoted to more or less organized play and recreation and to other public park purposes.

Careful Planning of Large Sites

In many cases, sufficient land for an athletic field, a play field and a proper landscape setting for the school building is provided by the school property. In such cases it is highly important that the location of the school building and the provisions for the various activities connected with it be studied as parts of a well-considered plan of the entire property. As an example, the landscape plan for the Ossining, N. Y., Junior-Senior High School is shown.

Situated at the top of a steep slope, which extends to the avenue at the west, the building has a fine outlook and also appears to advantage from the avenue below. Directly back of the school is an athletic field, beyond which are tennis courts. It is to be noted that no roadway connects the school with the avenue at the west, which is a heavily traveled highway. A study of the property showed immediately that a roadway leading down hill from the school into the traffic would be very dangerous. Consequently, a roadway was brought in on level ground from the public road at the other end of the property, which is a much less traveled thoroughfare. This arrangement also made it possible to use the level ground at the rear of the school along the tennis courts for parking space.

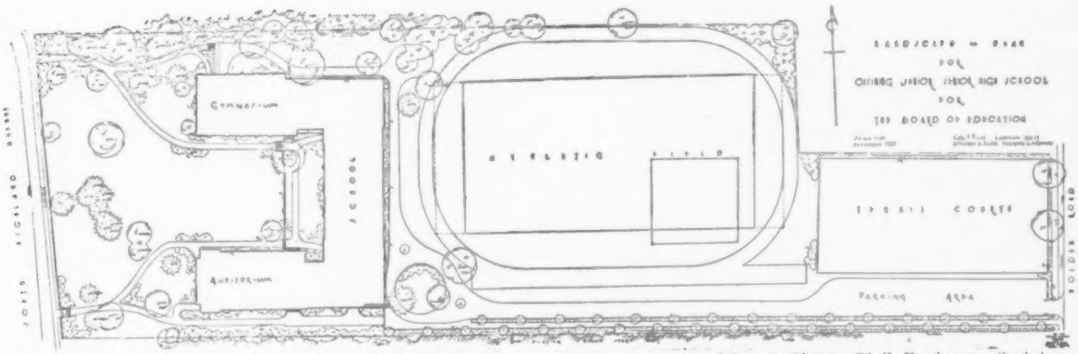


Carl F. Pilat, Landscape Architect, New York City

THE PLAN FOR RIVERSIDE PARK AND THE BOARD OF EDUCATION ATHLETIC FIELD AT BOGOTA, N. J.

A Small Town's Plan

What can be done by a small community is shown in a striking manner by the general layout of grounds for the Hanover High School, Hanover, Mass. The right beginning was made in this instance, and that is the most important step of all. Under competent professional advice, the committee recognized the desirability of obtaining a site that included sufficient area for the development of proper play spaces.

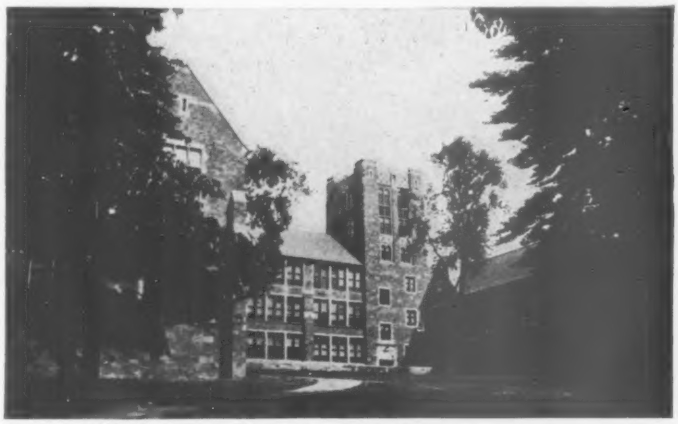


Carl F. Pilat, Landscape Architect, New York City *Applebee & Slater, Civil Engineers, Ossining*

THE LANDSCAPE PLAN OF THE JUNIOR-SENIOR HIGH SCHOOL, OSSINING, N. Y.
The road enters at the rear (the right of the plan) to avoid a steep grade and a heavily traveled highway at the front of the school. An athletic field, tennis courts and parking space are behind the school building

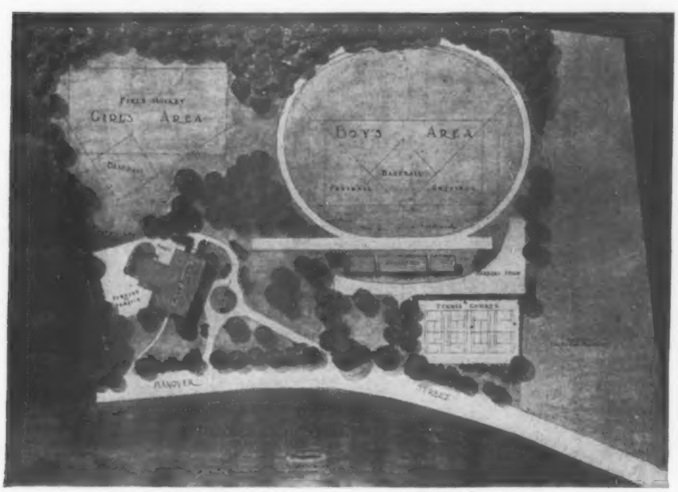
When the committee's wants were made known, a citizen came forward and donated the tract that is shown on the plan, approximately twenty acres. The layout for the entire development was made at the time the plans were drawn for the school building, in order that the building might be located properly with reference to the other features, though the possibility of constructing the play fields was regarded as very remote.

The school building was erected and the grounds in its immediate vicinity were improved, although the cost was considerable for a community which includes only about 2,500 people. About two years later it was found that a sum of money which came to the town through a bequest could be expended upon the development of the recreation area. After a very favorable contract was secured, the girls' and boys' areas, as shown on the plan, were cleared and seeded. They were wooded throughout and clearing them involved considerable labor. The surfacing of the running track, the preparation of the tennis courts and the building of the bleachers were not included in the contract, but it is expected that other money from the bequest will be available for carrying the plan to completion in a few years. The work mentioned was done in 1930 and the areas became available for use this year.



James Gamble Rogers, Architect, New York City
Carl F. Pilat, Landscape Architect

THE OSSINING JUNIOR-SENIOR HIGH SCHOOL OVERLOOKS A WIDE SLOPING GREENSWARD AND FINE TREES



Robert Washburn Beal, Landscape Architect, Boston, Mass.

THE GENERAL LAYOUT OF GROUNDS FOR THE HANOVER HIGH SCHOOL, HANOVER, MASS.

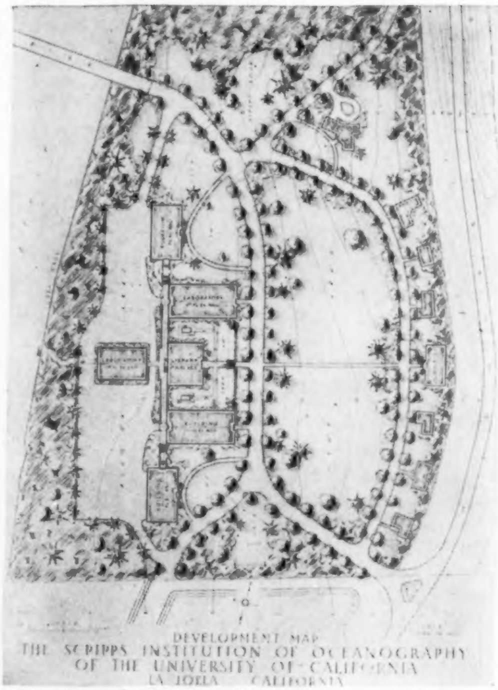
Private Schools, Colleges and Universities

The same general principles that apply to the planning of high-

school properties hold good in the case of private schools, although special requirements always differ with each school and call for the careful study of each individual problem.

The landscape treatment of college and university properties varies, of necessity, with the character and traditions of the institutions and with the characteristics of their sites and their architecture. In general, however, the common tendencies to excessive formality and to meagerness of planting should be avoided, while the walks, terraces and other paved areas should be of ample width to accommodate the greatest number of students that will ever have occasion to pass along them at any normal time. While walks should be in scale with the more or less monumental architecture of university buildings, excessively wide paved areas should be avoided, as they have a cheerless air about them. Informal planting of shrubs should, so far as possible, be brought in close to the buildings, to create a homelike atmosphere. Great open areas of greensward with fine trees through which the buildings can be seen give the necessary perspective and dignity. Avenues arched by the branches of trees, meadows and lawns, a ramble and gardens, all contribute to such schemes of treatment.

The older universities and the landscape treatment of early American country places afford a much better guide to the development of university grounds than do the more formal European villa gardens. These American traditions, together with the character of the site and the architecture of the buildings on it, form the best bases for landscape design.



J. W. Gregg, Landscape Architect, Berkeley, Calif.

THE DEVELOPMENT MAP OF THE SCRIPPS INSTITUTE OF OCEANOGRAPHY OF THE UNIVERSITY OF CALIFORNIA, AT LA JOLLA, CALIF.

Cook, Hall and Cornell, Landscape Architects, Los Angeles, Calif.

A VIEW OF THE CAMPUS, POMONA COLLEGE, CLAREMONT, CALIF.

Many Types of Treatment Possible

A number of photographs showing interesting bits of widely different landscape treatments of school grounds, playgrounds and universities in various parts of the country are presented for the value of the suggestions they contain and to indicate the high character of the work which is now being done from coast to coast in beautifying and rendering more orderly and useful the grounds connected with educational institutions.

For Directory of Landscape Architects for University and School Projects, see Section XIII of this volume.

Lighting of College Campuses and Athletic Fields

BY F. D. CROWTHER
ILLUMINATING ENGINEER, GENERAL ELECTRIC COMPANY

A GREAT deal of time and thought is given, and a great deal of money is spent, in beautifying our college and university campuses. It would seem logical that the results of these efforts should be enjoyed by as many as possible, and under the most favorable circumstances. The advantages of floodlighting college buildings and lighting the roadways and walks of the campus are rapidly being appreciated, as the illustrations show.

Illuminating the Campuses

Consider how the various forms of lighting can be justified in the college budget. Street lighting is of course a necessity, and should be carried directly by the college. The roadways of college campuses are best lighted by ornamental street-lighting units with luminaires and standards of design in keeping with the architecture. Twenty to forty lumens * per linear foot of roadway is

* Approximately equivalent to 2 to 4 candlepower.

Courtesy of the Union Metal Mfg. Co.

DAY VIEWS OF THE CAMPUSES OF GIRARD COLLEGE, PHILADELPHIA, PA., AND (ABOVE) THE UNIVERSITY OF CALIFORNIA
Showing lighting standards

considered good present-day practice for this type of lighting. From a roadway lighting standpoint, the lighting standards should be staggered on opposite sides of the roadway. In locating the standards, however, the appearance in relation to the buildings must also be considered.

Many institutions have elaborate commencement exercises with a definite fund for beautifying the campus during this period. Rather than put up temporary decorations, how much better to permanently floodlight a group of buildings. Graduating classes and alumni often make gifts to their schools. Nothing could better call attention to that class and their gift than the presentation of a floodlighting installation or an electric fountain in some appropriate spot.

Most colleges and universities have some monument or statue about which center history and legends. Interest in such monuments is heightened when proper floodlighting focuses attention on them.

Floodlighting Buildings

No rules can be given for floodlighting buildings, as each one is a problem in itself. Since there is usually very little extraneous light around the campus, the intensities required for building floodlighting are generally low. Excellent results are obtained with from one to two foot-candles, although here, again, all buildings vary and must be studied separately. Buildings are floodlighted from floodlighting projectors which may be mounted on the building itself, if the design permits, or may be mounted on ornamental standards similar to the street-lighting standards. Another very effective and very popular method is to mount the projectors on the ground and conceal them by shrubbery.

If it is not desired to floodlight the building continually, the lighting may be used for special occasions, such as homecoming, reunions, commencement, and junior weekends. Colored lighting is very appropriate for these occasions, as it adds to the gala festival atmosphere.

COLLEGE BUILDINGS GAIN AN ENTIRELY NEW BEAUTY WHEN THEY ARE FLOODLIGHTED AT NIGHT

The Lighting of Gardens

One of the most effective uses of lighting is in bringing out the natural beauty of a campus. Gardens and unusual flower-beds are even more interesting at night than in the daytime, as they may be floodlighted to concentrate attention on individual flower-beds, with no distracting objects visible. Electric fountains, with their endless va-

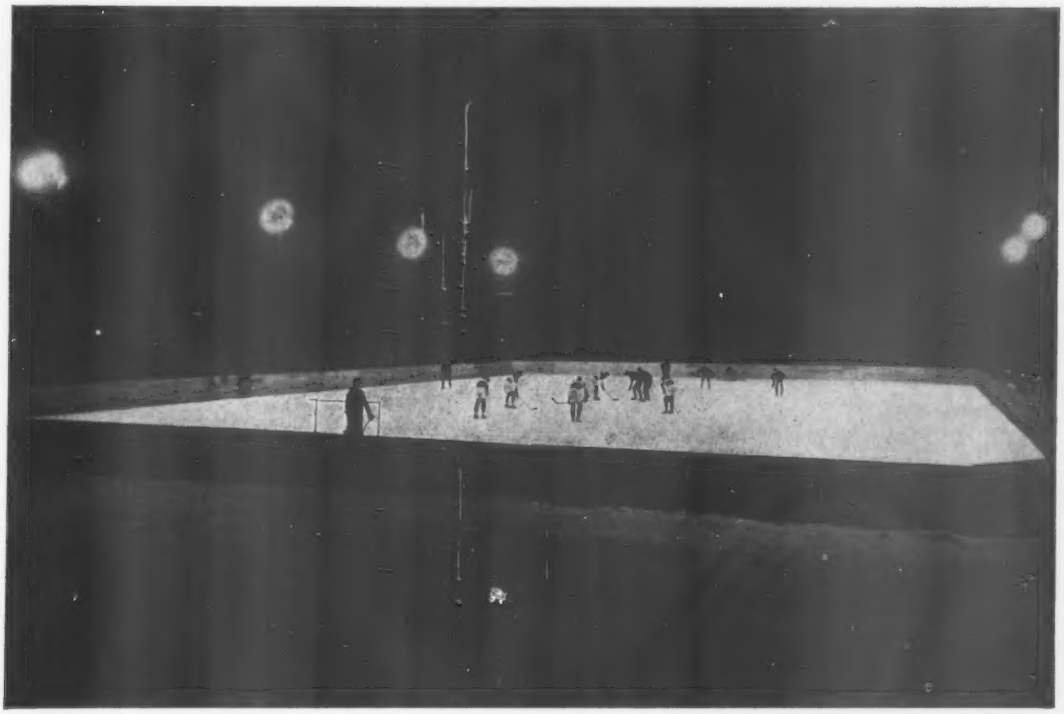
(*Continued on page 208*)

COLORED LIGHTS ADD TO THE FESTIVITY OF REUNIONS AND HOMECOMINGS

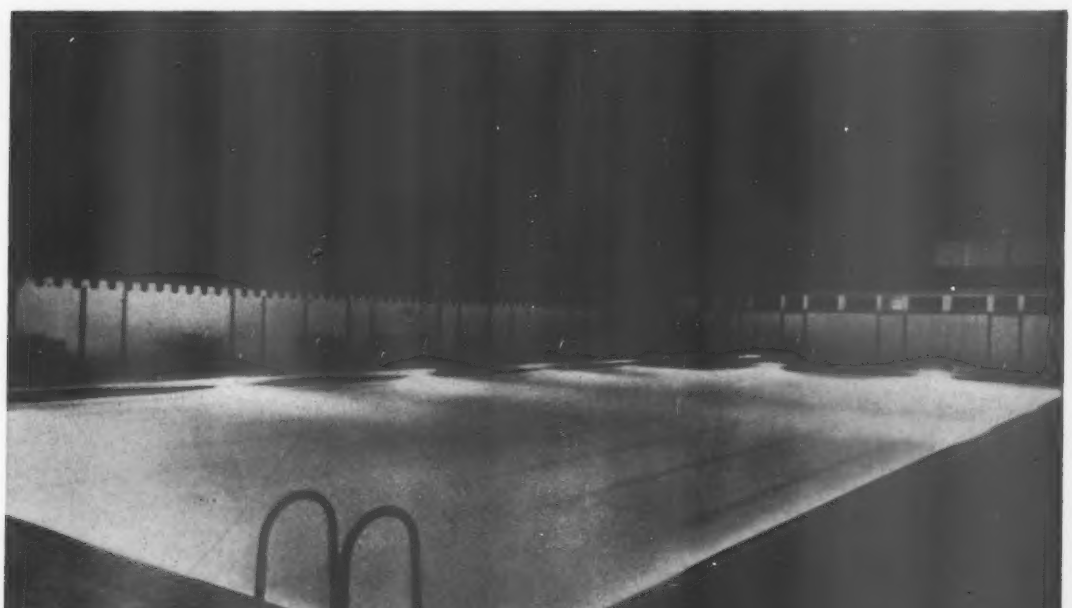
THE ILLUMINATION OF GARDENS AND FORMAL FLOWER-BEDS PROLONGS THE HOURS DURING WHICH THEY MAY BE APPRECIATED

A NEW ERA IS OPENING FOR FOOTBALL WITH THE ADOPTION OF FLOODLIGHTS ON COLLEGE ATHLETIC FIELDS

WHEN TENNIS COURTS ARE LIGHTED, THEIR USEFULNESS MAY BE DOUBLED



THE PROBLEM OF FINDING TIME AND A PLACE IN WHICH TO PRACTICE ICE HOCKEY IS SIMPLIFIED WHEN TENNIS COURTS CAN BE FLOODED AND LIGHTED



SWIMMING POOLS HAVE NO DARK CORNERS WHEN THEY ARE LIGHTED UNDER WATER

riety of color and water effects, make a very beautiful center of interest in a garden.

Athletic Fields

Athletic field floodlighting makes possible outdoor sports at night. This allows parents to see more of the athletic activities of a school, thereby arousing their interest. It also enables alumni and students with a busy daytime program to follow the college sports. Not a small factor to consider is that many of the sports which have not been self-supporting are becoming self-supporting. The increased gate receipts from football are now building better grandstands, improving the grounds and aiding the minor sports financially.

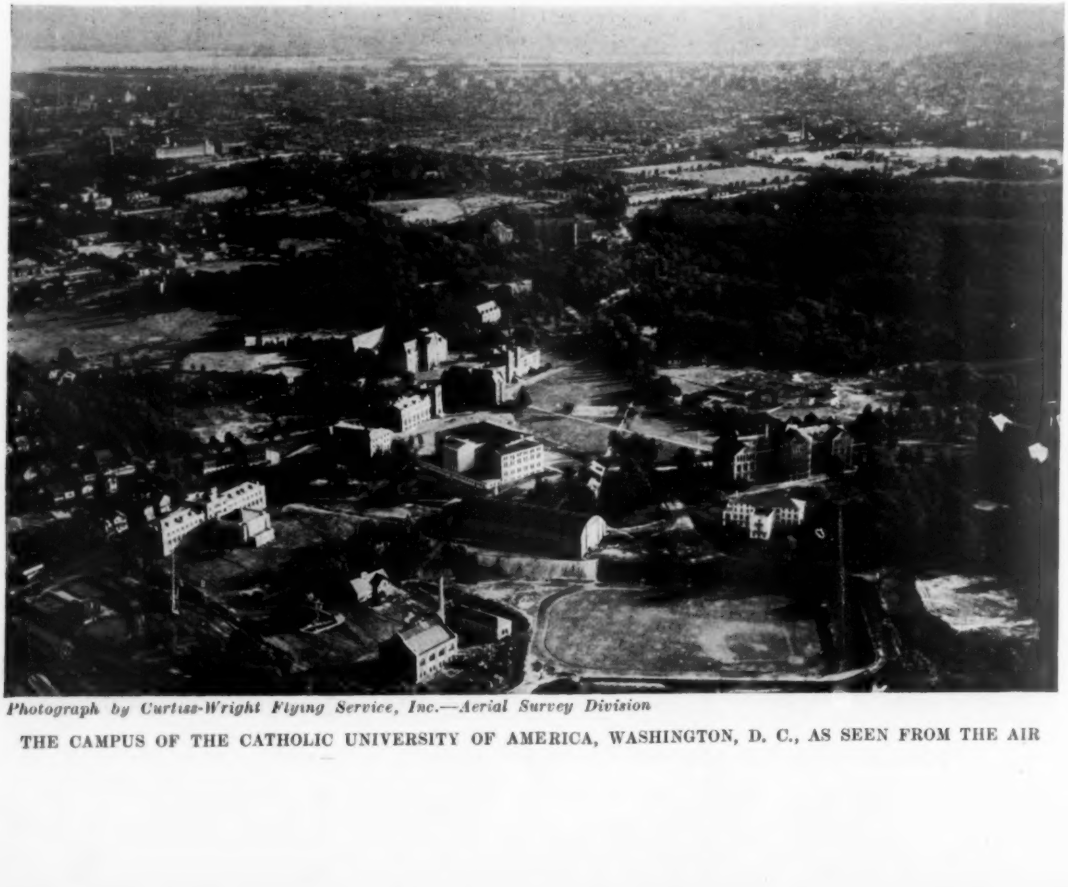
If the football field and baseball diamond are in the same stadium, one lighting installation will serve for both sports. Baseball is the most difficult to light and must be considered first. If the baseball stadium is adequately lighted, football, track and soccer may be played under the same lighting. Polo is another sport which can be played as well at night as in the daytime.

Tennis courts are used after working hours, and if lighted, may be used by the busy student and also by the faculty in the evening hours. In the parts of the country where ice hockey is played, it has always been a problem to find time for practice, because darkness falls early in the fall and winter months. A very practical solution to this problem is to design a group of tennis courts so that they may be flooded in the winter for ice hockey. One lighting installation will then take care of both sports.

Swimming pools, either indoors or outdoors, should be lighted. The best method of lighting swimming pools is to light from under water by means of floodlighting projectors reset in niches along the sides of the pool.

The possibilities of the use of light in and around college and university campuses are numerous, and the applications have only begun. The development of new devices in the field of lighting will lead to new ways of beautifying and enhancing the usefulness of the college campus.

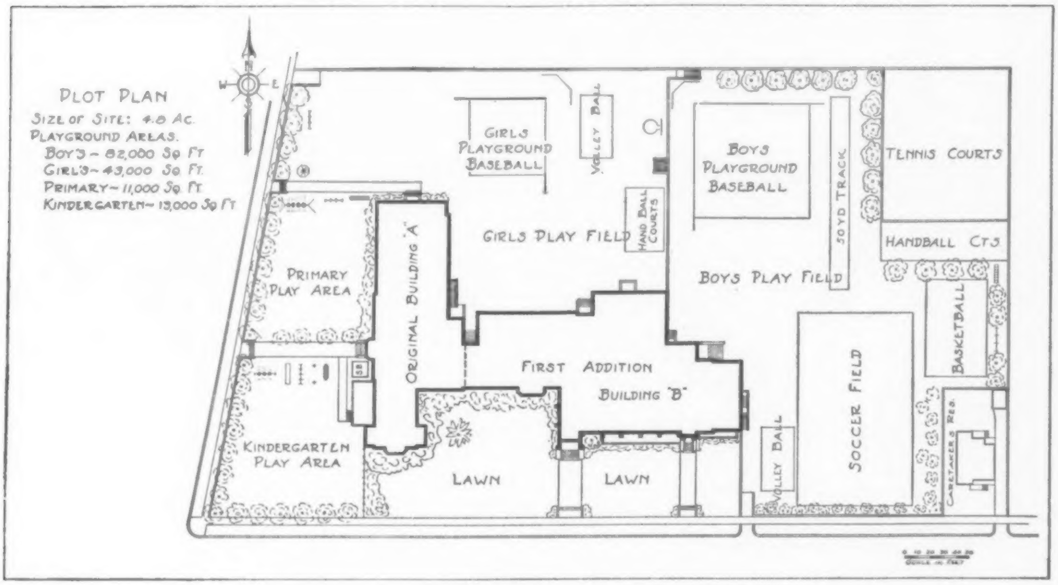
Aerial Views Are Aids in Campus Planning



Photograph by Curtiss-Wright Flying Service, Inc.—Aerial Survey Division

THE CAMPUS OF THE CATHOLIC UNIVERSITY OF AMERICA, WASHINGTON, D. C., AS SEEN FROM THE AIR

Four Elementary School Plot Plans



DANIEL WEBSTER SCHOOL, PASADENA, CALIF.

This layout reveals intelligent planning. The entire area is put to effective use. The many plantings add to the attractiveness of the grounds, yet very little space is devoted to strictly landscape purposes. The special areas set aside for kindergarten and primary children are properly isolated from the play fields of the older boys and girls. These fields provide for a variety of games and sports, and are arranged in such a way as to secure the maximum use of the areas. It is apparent from this plan that a five-acre site, even though wisely planned, is none too large for an elementary school.

The plot plans reproduced on this and the following page were selected by the Editor of The American School and University from the exhibit of 75 elementary school buildings and grounds collected by the National Advisory Council on School Building Problems. (See p. 27.)

The comments on the plot plans were prepared by George D. Butler of the National Recreation Association at the request of THE AMERICAN SCHOOL AND UNIVERSITY.

LONGFELLOW ELEMENTARY SCHOOL, PONTIAC, MICH.

This is an adequate school site, which makes possible a pleasant setting for both the present and future school building needs, and also provides ample play areas and facilities. The playground is of sufficient size and laid out in such a manner as to make it suitable for use by both young people and adults during such times as it is not needed for school groups.

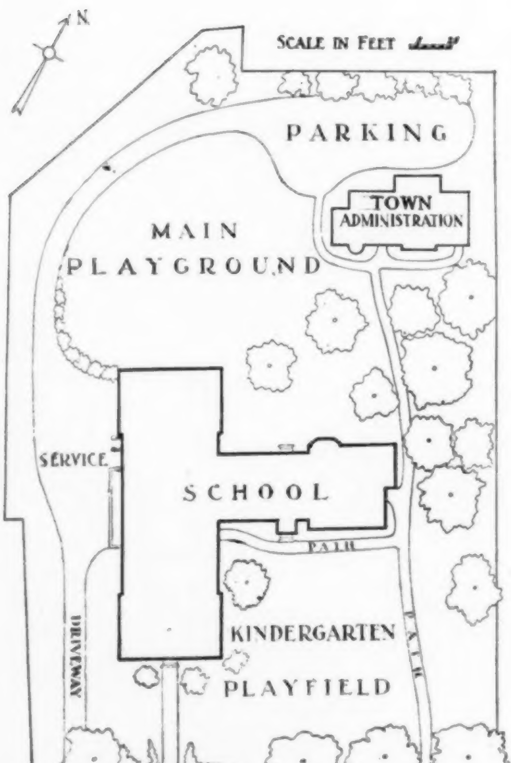
The plot occupies 8½ acres, of which 92,000 square feet is used for a boys' playground, 63,000 square feet for a general playground, 27,000 square feet for a girls' playground, and 11,000 square feet for a children's playground. These areas are large enough to accommodate at one time a variety of games, sports and play activities serving a large number of children.

The equipment for the children's playground consists of a sand box, a slide, a ladder, a swing, a teeter and a large swing frame. This apparatus is wisely concentrated near the school building. It might be better to place the three tennis courts together, thereby saving considerable expense both in original cost and maintenance. There might also be some advantage in having the experimental gardens near the school; they could be placed in the southeast corner of the play area where the two tennis courts are now located.

ANNA B. LACEY ELEMENTARY SCHOOL, HAMILTON COUNTY, TENN.

This plan indicates that ample space has been provided, although much of it, because of its topography, is not suited to organized games and sports. The wooded slope, however, offers an opportunity for many interesting and worthwhile play activities, and the whole site should lend itself easily to landscape development.

The primary playground, shown at the extreme right of the plan, is wisely placed adjoining the building. Unless there is some special reason for doing so, it seems unnecessary to have a fence between the playground sections allotted to the boys and to the girls. Since the space is limited, it might be preferable to have one set of apparatus and to provide a number of game courts serving both boys and girls. The athletic field, although not large enough to permit the playing of regulation games of baseball, football and other sports, is ample for elementary school use and should make possible the playing of a variety of games suitable for the older pupils in the school.



WYMAN SCHOOL, WINCHESTER, MASS.

The plan of this school is interesting and allows a number of attractive landscape features. The site occupies approximately 108,000 square feet, 19,000 of which is devoted to the main playground and 11,000 to the kindergarten play field. This does not allow very much space for organized play activities. The school building occupies practically one-half as much space as is allowed for play purposes. If, however, the playground apparatus were located under the trees to the west of the path, and if the remaining play area were carefully planned to provide a variety of group activities, a considerable number of children might be served, in spite of the fact that the area is too small to provide all of the desirable activities for an elementary school.

AMERICAN FENCE CONSTRUCTION CO.

524 Fifth Avenue, New York, N. Y.

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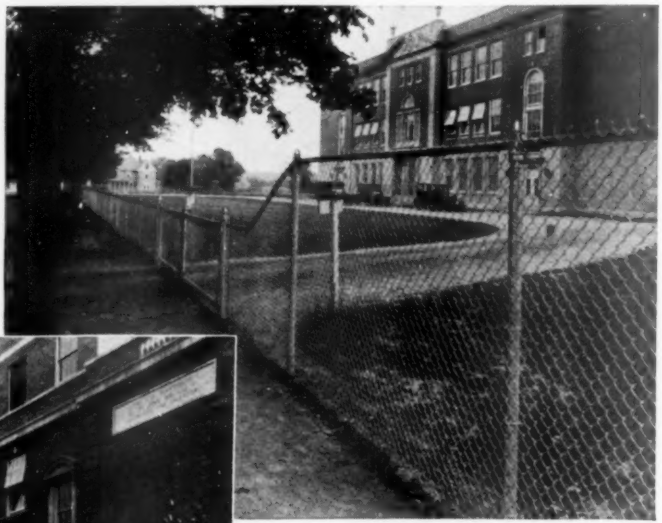
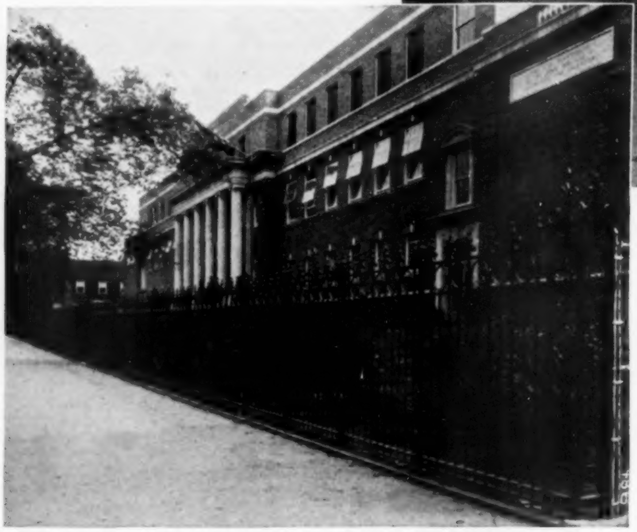
"AFCO" School Fences

This Company offers a wide and complete selection of standard Chain Link Fences (including Athletic Field, Unclimbable type, Tennis Court enclosures, Baseball backstops), and Iron Picket Fences. In addition it is prepared to furnish special enclosures and ornamental iron work from architects' designs.



"AFCO" GUARDIAN FENCE, 5 FEET HIGH (See Specification)



AN ORNAMENTAL "AFCO" IRON FENCE
Designed by Howard Chamberlain, Architect for Yonkers, N. Y., School Department

"Afco" Fences—whether copper bearing steel chain link, or wrought iron picket—are a quality product. Every part of an "Afco" Fence is designed and constructed to give a lifetime of service.

Erection Service — The erection of a fence is of vital importance. In our compact, close-knit organization, trained erection crews are given close supervision to insure a well done, economical job.

Advisory Service—"Afco" salesmen are prepared to make suggestions and submit drawings to cope with special ground conditions, cooperate in writing specifications, survey the ground and recommend the proper placement of fence and also help to select the proper type of fence to meet existing conditions. This service is offered to school superintendents and engineers as a part of the complete "Afco" Fencing Service.

Iron Picket Fences

Iron Picket Fences, because of the infinite possibilities of ornamentation, are standardized only in respect to the general use of certain "plain" picket types. Ornamental work, special gates, etc., are executed in infinite variety.

Chain Link Wire Fences

Chain Link Wire Fences, however, are a standardized product, in heights from 4 to 10 feet, as per specifications presented on following page. All are built with Afco Chain Link fabric of rust resisting, copper bearing steel wire, galvanized after weaving by the special hot dip process.

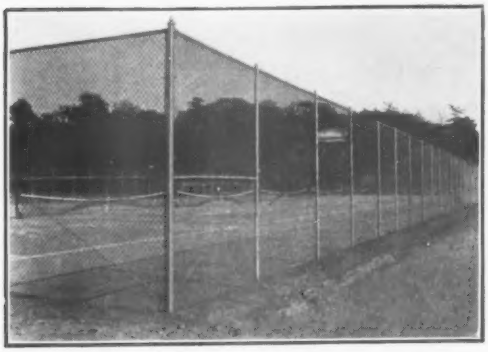
Catalogs, installation views, and blue prints of standard and semi-standard designs of iron or wire fence are available for reference.

Specifications

"AFCO" GUARDIAN FENCE for school property lines. (See illustration on facing page.)

Standard Heights—4, 5 or 6 ft.

Posts—End, corner and gate posts for gates up to 12-ft. openings, 2-in. square tubing (weight 3.65 lbs. per lineal foot). Line posts, 2-in. o.d. pipe (weight 2.65 lbs. per lineal foot). Line posts spacing 10 ft. on centers.



A TYPICAL "AFCO" TENNIS COURT FENCE

Top Rail—Along the entire length of the line of fence with the exception of the gate openings, a reinforcing top rail of 1⅝-in. outside diameter standard weight pipe, the lengths coupled together with outside expansion sleeve couplings.

Wire Fabric—One single course of AFCO Chain Link woven in a 2-in. mesh of No. 9 W. & M. gauge wire (medium weight) or No. 6 (heavy weight). Top and bottom selvages twisted and barbed. Hot dip galvanized after weaving to give a coating of not less than 1.2 oz. per square foot of actual wire surface. Fastened to the line posts and top rail with bands and clips and to the terminal posts with tension bars.

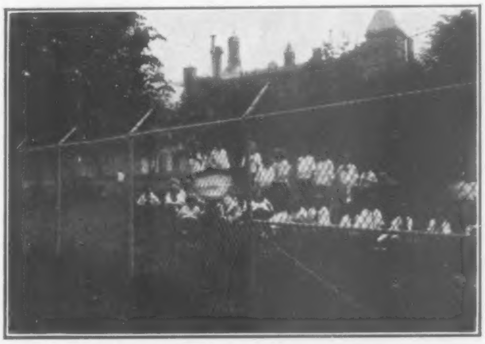
Bottom reinforcing—One course of No. 7 galvanized coil spring wire running horizontally with the wire fabric, and fastened thereto at intervals of not over 2 ft.

Gates—Standard sizes, 4 ft. single, 8, 10 and 12 ft. double, made of 1½-in. square tubing welded at all joints, complete with hinges and locking attachment for padlock.

Framework Finish—All framework parts galvanized by the hot dipping process after fabrication.

Concrete Post Footings—All posts to be set in concrete of a 1-3-5 mix, Portland Cement, sand and crushed stone or gravel, cast rough in the ground and domed above to shed water. Those for terminal posts to be 15 in. in diameter and for line posts 10 in. in diameter and not less than 3 ft. in depth.

In General—All materials to be the very best of their respective kinds. When AFCO erects, price includes furnishing all labor, tools and concrete materials but not rock drilling unless specifically mentioned.



"AFCO" TYPE 1103 CHAIN LINK FENCE WITH BARBED WIRE AND TOP RAIL

"AFCO" Bulwark Fence (for Heavy Duty)

This type is heavier than Guardian and is recommended wherever the service requires maximum ruggedness in a fence.

Standard Heights—6, 7, 8, 9 and 10 ft.

Posts—End, corner and gate posts for single gates up to 6 ft. or double gates up to 12 ft., 2½-in. square tubing (weight 6.50 lbs. per foot). For larger gates up to 24 ft. double, 3-in. square tubing (weight 9.70 lbs. per foot). Line posts—2¼ x 1¾-in. special oval back beam section (weight 4.25 lbs. per foot). Post spacing 10 ft. on centers.

Gates—Frames made of 2-in. square tubing welded at all joints, completely equipped with heavy hinges and locking device. Standard sizes —4 ft. single—8-10-12-14-16-18 ft. double.

The foregoing Guardian Fence specification will apply in all other respects.

Athletic Field Fence—Non-Climbable Type, "AFCO" Type 1103 Fence

Illustrated above.

This type is made with a top barbed wire overhang and is standard for enclosing college, school or municipal athletic fields. Furnished in standard heights of 7 or 8 ft. over all from ground to top of barbed wire.

Posts—End, corner, gate and line posts same sizes as in Bulwark Fence specification. Line posts equipped at top with one-piece pressed steel arm inclined inward at an angle of 45 degrees, to which is attached three courses of four-point close set barbed wire galvanized after weaving.

Top Rail, Wire fabric, Framework finish, and erecting specifications same as for Guardian Fence.

Gates—Standard sizes 4 ft. single, 8, 10, 12, 14, 16 and 18 ft. double. Frames made of 2-in. square tubing welded at all joints, completely equipped with heavy hinges and locking device.

COLDWELL LAWN MOWER COMPANY

Newburgh, N. Y., U. S. A.

FACTORY BRANCH
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Since 1867 Coldwell Dependable Lawn Mowers have been contributing in a large measure to the development and maintenance of beautiful Lawns throughout the entire civilized world. Successive improved models have been developed to meet the varying conditions in the different sections of the country; keeping in mind constantly the importance of strict adherence to the original Coldwell policy; to provide at all times a **thoroughly dependable** lawn mower and a size and style suited for every lawn mowing and rolling problem.

ROLLING AND MOWING ON STADIUM AT UNITED STATES MILITARY ACADEMY, WEST POINT, NEW YORK

"L"-TWIN WITH GANG ATTACHMENT, CUTTING 60-INCH SWATH ON GROUNDS OF MT. SAINT MARY'S ACADEMY

The large lawns and athletic fields now so common a sight in connection with public schools, universities and colleges require special thought and care if they are to be kept beautiful and efficient and thus reflect the proper atmosphere of the setting.

The value of a light rolling with each successive mowing has long since been recognized. It helps to control dandelions and other lawn pests, firms the soil around the tender grass roots, helps to conserve moisture, irons out the surface and produces a fine velvety finish to the turf. The successive rolling of baseball, tennis and other athletic fields is, of course, essential to the development of a smooth playing surface.

EXTREME FLEXIBILITY PERMITS OF CLOSE TRIMMING

The Coldwell Power Lawn Mowers and Rollers are especially well adapted for the use of schools and colleges. Being equipped with **full width drive rollers,** they may be used for **combined rolling and mowing,** or for **separate rolling** only. The principal weight of the machine is carried on the roller which prevents marking and permits of trimming clean along walks and driveways. The use of hand mowers for trimming is practically eliminated.

The brief description of the various models on the opposite page will aid you in the selection of the "Coldwell" best suited for your grounds.

Let us send complete details or arrange with nearest Coldwell distributor to demonstrate.

"TWIN THIRTY" WITH RIDING SULKY ON HIGH SCHOOL GROUNDS

"Twin Thirty"

Rolls and **mows** simultaneously six to eight acres per day. Has full 30-inch, two-section drive roller with differential between rollers to prevent marking and make turning easy. 30-inch, 5-blade cutter.

Equipped with **two-cylinder,** four-cycle, water-cooled motor which provides an abundance of reserve power, is free from vibration and noise and will develop maximum power continuously in hottest weather without overheating.

Riding sulky for the operator, also grass catcher may be had as extra equipment.

Extremely useful where athletic fields are to be maintained.

"L" Twin

Rolls and **mows** simultaneously four to six acres per day. Full 25-inch, two-section drive roller with differential. 25-inch, 5-blade cutter.

Two-cylinder, four-cycle, water-cooled motor supplies unusual reserve power.

This model may be had with the two 20-inch auxiliary gang units which increases the swath to 60 inches and more than doubles the capacity. Very useful for the wide open stretches of lawn.

In the "L" Twin is combined extreme flexibility for trimming and terrace work; a 25-inch combined mower and roller or separate roller and, with the gang attachment, a mower of exceptionally large capacity.

Riding sulky for the operator, also grass catcher may be had as extra equipment.

"L" Junior

Rolls and **mows** simultaneously four to six acres per day. Full 25-inch, two-section drive roller with differential. 25-inch, 5-blade cutter.

A powerful, single-cylinder, four-cycle, water-cooled motor drives this light-weight mower and roller, furnishing plenty of power for use on grades and in tough grasses. Simple and sturdy in design and construction and moderate in price. Thoroughly dependable and extremely economical in operation.

Grass catcher may be had as extra equipment.

"Cub"

Rolls and **mows** simultaneously three to four acres per day.

Full 21-inch, two-section drive roller with differential. 21-inch, 5-blade cutter.

A light weight, simple, economical and dependable power mower and roller at a very moderate price. Especially well suited for lawns surrounding the smaller schools and also very useful for trimming and cutting the small plots on the larger campuses.

Equipped with a 4-cycle, water-cooled motor having unusual power for the size and weight of the machine. Unexcelled for hilly lawns.

Standard Features in All Coldwell Models

Full-width drive rollers
Four-cycle, water-cooled motors
All machines complete, including the motor, designed and built in the Coldwell factory
Timken tapered roller bearings throughout
Tillotson Automobile Type Carburetor
Alemite-Zerk force feed lubrication
Oil tempered, self-sharpening blades
Automatic spring loaded clutches require no adjustment
Three Speeds—Low, Normal and High
Combined rolling and mowing, or separate rolling when desired
Thoroughly dependable, trouble-free, economical operation over a period of years
A large selection of styles and sizes and at prices assuring the greatest possible value

The Gang Lawn Mower

Consists of five 21-inch mowers that mow a swath 96 inches wide. Designed especially to withstand the strain and hard wear of a tractor-drawn outfit. Amazingly sturdy, yet exceedingly flexible on hilly or uneven ground. Furnished with three-unit gang (60-inch cut), or a five-unit gang (96-inch cut).

A Complete Dependable Line of Hand, Horse and Power Lawn Mowers

SINCE 1867
COLDWELL
DEPENDABLE LAWN MOWERS
Hand—Horse—Gasoline—Electric

IDEAL POWER LAWN MOWER COMPANY

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Dealers in All Principal Cities

NEW IDEAL 30" POWER MOWER

Roller type—the "thirty" helps to build better sod by rolling as it cuts. New, more powerful motor, built with old reliability gives greater handling ease on corners and steep grades—faster work on open cutting. Controls at handles give easy, simple operation. High efficiency air-cooling system. 4-cycle engine. Bore and stroke, 3 x 3¾ inches. Magneto ignition. 6-inch diameter, high-speed, 5-blade cutting reel. Cuts 30-inch wide swath. Capacity up to 7 acres per day. Net weight, 595 pounds. Write for prices and complete details.

NEW IDEAL 22" POWER MOWER

Roller type—the new Ideal "twenty-two" handles up to four acres per day. Powerful new motor makes this moderately-sized roller mower remarkably easy to handle—even on steep grades and foliaged grounds. Cuts 22-inch swath. Motor has 3-inch bore and stroke. New air cooling system prevents overheating. Magneto ignition. Timken bearing crankshaft. Automobile-type valve tappet mechanism. Starting is exceptionally easy. Net weight, 455 pounds. Write for prices and complete data.

NEW IDEAL 25" POWER MOWER

This new **wheel-type** Ideal Power Mower possesses unsurpassed handling ease, due to powerful new motor and aluminum frame. Can be slowed down to a snail's pace for easy turning—instantly accelerated to fast walking speed for open cutting. New motor has mechanically opening valves; valve tappet mechanism resembles that of a fine car. Superior air cooling system prevents overheating. Cuts 25-inch swath. Capacity up to four acres per day. Engine has 3-inch bore and stroke. Net weight, 295 pounds. Write for prices and complete details.

NEW IDEAL 20" POWER MOWER

Smaller capacity, **wheel-type** Ideal Mower—with new engine and design—built with the time-proved reliableness of all Ideal Mowers. Particularly useful in moderately-sized, well-foliaged grounds that would be difficult to cut with a less easily handled mower. Powerful new motor gives great flexibility—low speed for turning—power for hills—speed for open cutting. Bore and stroke, 3 inches. Cuts 20-inch swath. Capacity up to 3 acres per day. Air-cooled motor does not overheat. Net weight, 275 pounds. Write for prices and complete details.

WORLD'S MOST COMPLETE LINE OF GRASS CUTTING EQUIPMENT

THE IDEAL TRIPLEX

There is no more useful mower than the Triplex, on large area jobs that are cut up by walks and foliage. Can cut as high as 35 acres per day. It backs up—turns in its own length—cuts right up to the edge of wall or walk—and when crossing rough ground, can pick up its cutting units. The Triplex can handle many cutting jobs, for rubber-tired wheels are easily attached, and it can travel any distance under its own power. Cuts an 84-inch swath. 4-cylinder, 4-cycle, 15-h.p. engine. Net weight, 2,100 pounds. Write for prices and details.

THE IDEAL BULLDOG

The famous Ideal Bulldog insures lower maintenance cost due to its simple, low-wheeled construction. Pushed forward and into the work, in the manner of a hand mower—the cutting units cannot jump or sway. The Bulldog can back up—can raise its cutting units while in motion, and ride over rough ground on the broad caster wheels. In 5-gang, or 3-gang size. 3-gang can be horse drawn, and later converted into 5-gang size. Write for complete facts and prices.

NEW IDEAL ROUGH MOWER

Built on the tried and proved Bulldog design —the new Ideal Rough Mower is lowering the cost of cutting golf course rough, and other jobs that require longer grass. Rugged Bulldog cutting units are close-coupled in design with stocky side frame that means freedom from high repair costs. Equipped with three, or five cutting units—that can be quickly raised for crossing roadways, or going to and from the job. Write for further details on this new mower that has already established many low-cost cutting records.

NEW IDEAL POWER GREENS-MOWER

Ideal now offers the acme in green cutting perfection—a light, powerful, power-operated mower for golf course greens. Built on the design of the Ideal hand Greensmower that has been successful for several seasons, the new Power model makes smoother cutting possible in less time. Aluminum construction gives lightness. Ball bearings give smoothness. 4-inch, 7-blade, cutting reel operates at high speed. Easily sharpened and serviced. Write for the details and prices.

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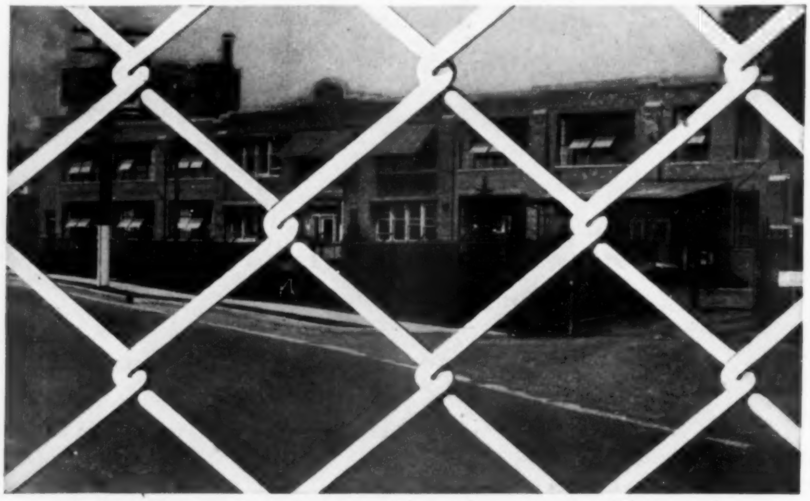
Factory Branch Office and Warehouse in Hartford, Conn.

SALES REPRESENTATIVES IN PRINCIPAL CITIES

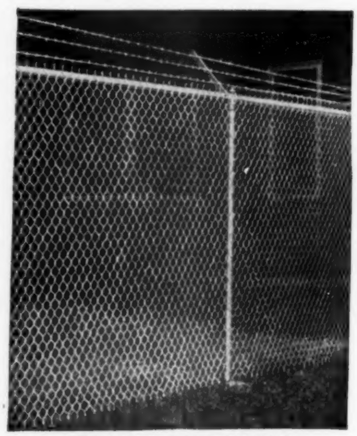


The Protection of Positive Assurance Through the Sturdy Mesh of an Atlas Fence

Property worth protecting should be enclosed with a fence that enhances its appearance and value—a fence that is not only low in first cost, but economical in the long run.

ATLAS FENCES meet these high standards because all the component parts used in the manufacture of Atlas fencing are properly related and matched for strength, exceptional durability and neatness of design.

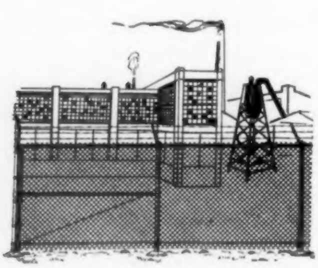
An Atlas "fence engineer" is at your disposal for consultation and to assist in the selection of a fence best suited to your individual requirements. No obligation is assumed for this service and you are urged to utilize the facilities and experience of the Atlas organization in the solution of your fence problems.



ATLAS ARMED FENCE

We are engaged exclusively in the manufacture of **iron and wire fences.** ATLAS FENCES are the product of a lifetime of experience, years of constant improvement and continued development, not only in their manufacture, but in their erection as well.

Atlas Standard Fence frame work is of high carbon open-seam tubular construction—one of the most lasting materials used in fence construction. We guarantee this frame construction not to rust out for a period of twenty years **because it has proved its long life over a longer period of years.**



Atlas Products

Chain Link; Woven Wire; Wrought Picket Fences, Enclosures, and Gates for:

Homes	Airports
Estates	Kennels
Playgrounds	Poultry
Factories	Tennis Courts
Institutions	Entrance Ways

Railroads

ALSO

Flagpoles	Arbors
Trellises	Grilles
Baseball Backstops	Window Guards
Tennis Net Posts	Partitions

and similar products

THE FATE-ROOT-HEATH COMPANY

976 Bell Street, Plymouth, Ohio

THE PEERLESS MOWER SHARPENER

The Peerless Mower Sharpener is a remarkable invention that sharpens all makes of power and hand mowers and cutting units scientifically, quickly, perfectly, doing the work as nothing else can.

One of the big expense items of a well-kept athletic field, campus or golf course is the cost of sharpening mowers and cutting units. Whether you sharpen your own, or have it done outside, you can save money by adopting the modern method—the Peerless Mower Sharpener. It not only **saves money** by sharpening mowers in one-half the time, but does the work **so much better** that there is really no comparison.

If you are using files, it is slow and expensive, as most mowers are now made with hardened blades.

A FEW OF THE HUNDREDS OF USERS OF THE PEERLESS MOWER SHARPENER

Brentwood Country Club....Los Angeles, Calif.
Baltusrol Golf Club ....Baltusrol, N. J.
Barrington School.......Gt. Barrington, Mass.
Columbus Country Club..........Columbus, O.
Cherryhill Club ....Denver, Colo.
Country Club, The ......Salt Lake City, Utah
Colo. State Teachers' College ....Greeley, Colo.
Culver Military Academy..........Culver, Ind.
Great Lakes Naval School.....Great Lakes, Ill.
Galveston Country Club........Galveston, Tex.
Highland Country Club........Pittsburgh, Pa.
Inwood Country Club ....Inwood, N. J.
Inverness Club ....Toledo, Ohio
Kahkwa Club ....Erie, Pa.
Kalamazoo Country Club......Kalamazoo, Mich.
Kenyon College ....Gambier, Ohio
Lansing Country Club..........Lansing, Mich.
Merion Cricket Club ....Philadelphia, Pa.
Nat'l Golf Links of America.Southampton, N. Y.
Naval Training Station..........Newport, R. I.
Northfield Seminary ....Northfield, Mass.
Northwestern University ....Evanston, Ill.
Okla. Agri. & Mech. Col. .....Stillwater, Okla.
Olympia Fields Country Club.....Matteson, Ill.
Pinehurst Country Club ....Pinehurst, N. C.
Piping Rock Golf Club....Locust Valley, N. Y.
Port Arthur Industrial School..Port Arthur, Tex.
Ridgewood Golf Club ....Cleveland, Ohio
Rochester Municipal Corp. ....Rochester, N. Y.
Rutgers College ....New Brunswick, N. J.
School of Mines ....Rapid City, S. D.
Skokie Country Club ....Glencoe, Ill.
Somerset Country Club ....St. Paul, Minn.
Seattle Golf Club ....Seattle, Wash.
Stambaugh Township Schools..Stambaugh, Mich.
Swarthmore College ....Swarthmore, Pa.
Tedesco Country Club ......Swampscott, Mass.
Tome School (The) ....Port Deposit, Md.
Winter Park Golf Club ......Winter Park, Fla.
Westchester-Biltmore Club ....Rye, N. Y.
Youngstown Country Club...Youngstown, Ohio

The new 1931 model **Peerless Mower Sharpener** not only **grinds** the mower, when the reel knives become very dull or thick, but with the new Reconditioner Attachment revolves the reel knives backward for "lapping in" with grinding compound or emery paste. This gives a perfect contact with the bed knife (straight blade). On putting green mowers this is of utmost importance.

When the reel knives become dull after the first grinding they can be reconditioned several times or until the reel knives become too thick at the cutting edge, when they should be reground. Grinding a mower with the **Peerless Sharpener** gives the proper bevel or clearance behind the cutting edge, makes the mower run easily and lengthens the life of the mower.

Simple to Operate—Equipped with a ⅓-Hp. motor—attach to your light socket. Place the mower in position, make a few simple adjustments, turn on the power, and in a few minutes you have a cutting unit with a razor-like edge. The Peerless Sharpener sharpens all makes of power, horse or hand mowers perfectly. Equipped with special grinding wheel for grass shears, hedge shears, sickles, etc., and an attachment for sharpening all makes of skates, including hockey. Can be used the whole year 'round.

We have a handsomely illustrated catalog awaiting your request. Write today—now—and learn the full possibilities of this wonderful machine.

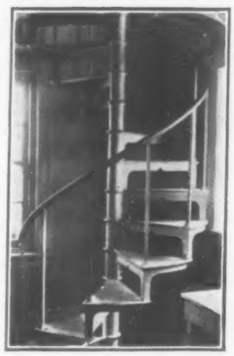
J. W. FISKE IRON WORKS

78–80 Park Place
New York, N. Y.

FISKE

For Ornamental and Utility Metal Work of Every Kind

Since 1858 J. W. Fiske Iron Works has been making all sorts of ornamental and useful things of iron, bronze and other metals for public schools and colleges, municipalities, industrial concerns, country clubs and private estates. Not only making them **well,** but making them **supremely well.** Through three generations of the Fiske family, J. W. Fiske Iron Works has grown into a stable institution and a national name which stands for superb craftsmanship in ornamental and utility metal work of every kind. Fiske products include:



- Chain Link Fencing
- Wrought Iron Railings
- Tennis Court Enclosures and Backstops
- Baseball Backstops
- Entrance Gates
- Bronze Tablets
- Bronze Doors
- Park Settees
- Seat Brackets for Concrete Stadiums
- Steel Flag Poles
- Wire Window Guards and Partitions
- Lighting Standards
- Weather Vanes
- Drinking Fountains
- Swimming Pool Equipment
- Ornamental Iron
- Manhole Covers and Frames
- Bronze Monuments
- Pipe Railing
- Aquaria
- Spiral Stairs

Chain Link Fencing

Because Fiske Chain Link Fencing is made of copper bearing steel, galvanized after woven, it stands at the very peak of fencing of this type. Furnished with either a chain link gate or an ornamental iron gate, it is accepted as a practical and ideal protection of any kind of school property. Simple in construction and remarkably enduring, all parts set in concrete, it offers both beauty and dignity as well as strength and long life.

Tennis Court Backstops and Enclosures

The same durable rustproof construction goes into Fiske Tennis Court Fencing as into all Fiske fencing. The stout wire mesh is woven close enough to prevent the ball from catching or going through.

Ornamental and Utility Metal Work of Every Kind

Fiske makes any and every sort of standard and special metal work in iron, brass, copper or bronze, from tree guards to park benches, from garden furniture to entrance gates, and from andirons to monument pieces. Everything that Fiske makes bears the impress of master craftsmanship and stands the wear and tear of time.

Write for the Fiske catalog, mentioning articles in which you are interested.

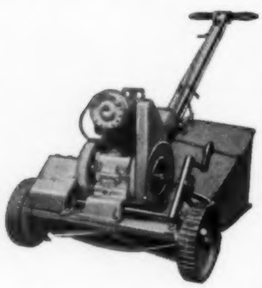
JACOBSEN MANUFACTURING COMPANY

740 Washington Avenue

Racine, Wisconsin

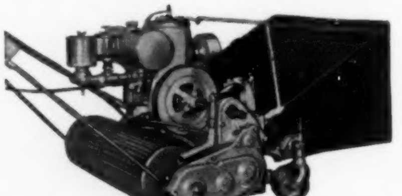
Jacobsen "Junior" Power Mower

This quality small power mower is a favorite on lawns of from ¼ to 2 acres. It is sturdy in construction and has many of the well-known Jacobsen features. The transmission is fully enclosed, with no chains or sprockets exposed to clog with dirt or sand. Reel and traction units are controlled by separate clutches. Equipped with a Jacobsen built motor with sufficient power for grades and terraces.



"Estate" Roller-Drive Mower

This mower represents the height of refinement in power lawn mowers. Particularly desirable for extra fine lawns. The roller traction protects delicate turf and gives a gentle rolling that is a benefit to the lawn. Built in two sizes—24 and 30-inch cutting widths. Cut gear transmission, and separate reel and traction clutches, enclosed in oil-tight housing. Auto-type differential makes turning easy. Quality construction throughout, and a powerful Jacobsen motor, results in low operating and upkeep cost.

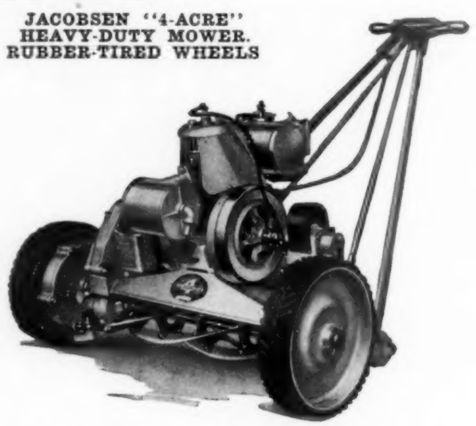


"ESTATE" ROLLER MOWER

"4-Acre" Heavy-Duty Mower

This sturdy general-purpose mower is the most widely known power mower made. It is the oldest of the Jacobsen line. Its fundamental design is the basis of the success of the entire Jacobsen line. Used for years by leading universities and colleges for mowing athletic fields and campuses. Has a record of low upkeep cost and trouble-free service in heavy-duty park and cemetery mowing. The cutting capacity is 4 to 5 acres a day—with sulky and gang attachment, 8 to 10 acres a day. It has a gear drive, enclosed in double housing and running in oil. The auto-type differential makes turning and steering easy. Separate reel and traction clutches. Powerful, quick-starting, dependable Jacobsen Motor. Mower can be equipped with special sickle bar attachment for cutting dandelions, buckhorns and other weeds.

JACOBSEN "4-ACRE" HEAVY-DUTY MOWER. RUBBER-TIRED WHEELS



Rubber-Tired Traction wheels are available for the 4-Acre model. They reduce vibration and wear and result in more quiet operation.

New 32″ Heavy-Duty Twin Mower

The latest development in the Jacobsen line is the New 32″ Mower with twin cylinders. Adapted for economically mowing large campuses and athletic fields. Capacity 1¼ acres with sulky per hour and 2½ acres per hour with sulky and gang attachment consisting of two extra 19-inch-side units. This new mower achievement has many exclusive features such as two-speed transmission, high and low gear, auto-type differential for easy turning and many other features. Write for further information.

Used by Leading Universities

- University of Arkansas, Fayetteville
- Rollins College, Winter Haven, Fla.
- University of Illinois
- Indiana University, Bloomington
- University of Kansas
- University of Minnesota
- University of Oregon
- University of Washington
- Northwestern University
- University of Wisconsin
- Catholic University of Washington, D. C.
- Niagara University, Niagara Falls, N. Y.

MODERN MACHINE WORKS, INC.

OFFICE AND PLANT

158–160 Milwaukee St., Dept. A, Milwaukee, Wis.

Red E

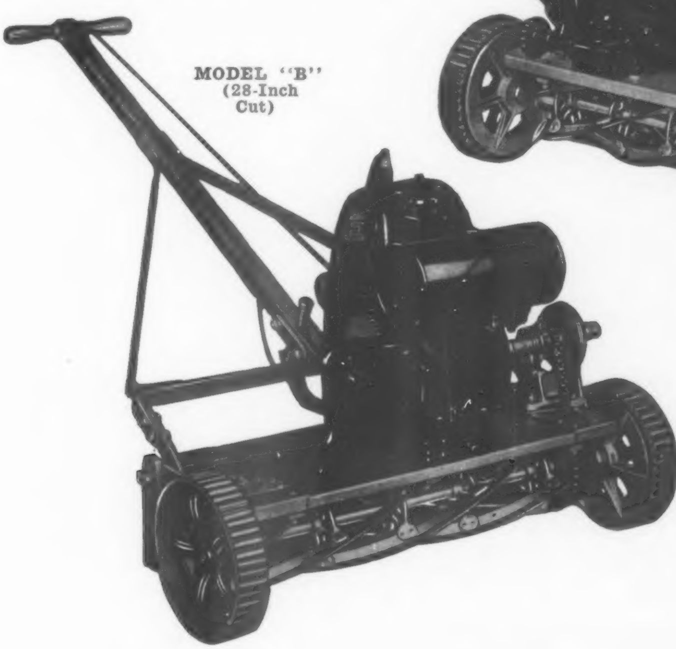
America's Finest Power Lawn Mower

QUIET — SAFE — TROUBLE-PROOF — COMFORTABLE — ECONOMICAL LAWN MOWING WITH THE "RED E"

The "Red E" Power Lawn Mower is particularly adapted for school and college grounds. Cutting close to buildings, walks, drives, trees and shrubbery, it leaves but little hand trimming and clipping to be done. Wherever there are large lawns or grass plots to mow, the "Red E" will prove a time-, labor- and money-saver.

The "Red E" is the simplest power lawn mower on the market—having fewer working parts, running more easily, and with less upkeep expense. Built to last through years of constant use, it has many exclusive features which contribute to easier operation and longer service. The four-cycle air-cooled motor operates efficiently with little consumption of gasoline and lubricating oil. **There are no noisy gears in the "Red E."** Speed is instantly controlled by a throttle conveniently located at the top of the handle. **A New "Red E" Feature** is the cushioning of the handle, to take up any shock, permitting the operator to mow with greater ease. Users of "Red E" declare it leads the field in mechanical performance and economy.

MODEL "A" (20-Inch Cut)



MODEL "B" (28-Inch Cut)

6 Facts About the "Red E"

1. Saves time:—will cut 3 to 6 times as much grass per day as a handmower.
2. Saves labor: — eliminates back-breaking hand-mowing.
3. Saves money:—gives maximum mowing mileage at minimum cost.
4. Saves in satisfaction:—keeps lawns trim and beautiful.
5. Saves in depreciation:—outwears other types of mowers.
6. Saves in capital investment: —pays for itself in a few years.

THE MOTO-MOWER COMPANY

MAIN OFFICE AND FACTORY

3246 East Woodbridge Street

Detroit, Michigan

"A Twist of the Wrist Guides It"

CITY Model
21″ Cut

Moto-Mower's Efficient Cutting Qualities Save Labor and Improve Lawn Appearance

There are Moto-Mowers built for every size of lawn. The 3-WAY Moto-Mower, equipped with two 19″ trailers and a sulky, cuts a 60″ swath, 10 to 20 acres per day, on two gallons of gasoline. The DETROIT model, 27″ cut, climbs a 35 per cent grade, mows 3 to 5 acres per day, consuming about one gallon of gasoline. The CITY model, 21″ cut, mows 2½ to 3 acres per day. The JUNIOR model, 18″ cut, mows 1 to 2 acres per day. All models except the JUNIOR have twist-of-the-wrist steering. Write for catalog and prices. There's a Moto-Mower model that will meet your requirements perfectly.

Years of Superior Performance Account for Moto-Mower's Increasing Popularity

Moto-Mower popularity is based on efficient, economical, trouble-free grass cutting. All Moto-Mower models are built of the highest quality materials and contain many refinements in construction and operation. Twist-of-the-wrist guiding, the greatest advancement in the science of power lawn mowing, is an exclusive Moto-Mower feature. It allows the unskilled laborer to cut lawns as easily and efficiently as the experienced gardener, thus achieving savings in labor that match Moto-Mower's low cost of maintenance.

"A Twist of the Wrist Guides It"

DETROIT Model
27″ Cut

Moto-Mower
TRADE MARK

STANDARD OIL COMPANY OF NEW YORK

26 Broadway, New York, N. Y.

Socony Asphalt Binders "B" and "C"

Socony Cold Patch Asphalt

STANDARD ASPHALTS (Socony Brand)

Socony Liquid Asphalt

Socony Asphalt Joint Fillers

Asphalt Macadam Roads

Asphalt Macadam Roads built by the Penetration Method are recognized by leading engineers as one of the most durable types of construction, being economical in cost and maintenance. This type presents a non-skid, all-weather surface, ideal for school and university grounds.

Socony Asphalt Binders "B" and "C" are widely used for such construction, in amounts varying from 2 to 3 gallons per square yard, being applied at temperatures ranging from 275 degrees to 350 degrees.

For Surface Treating of Gravel Roads and Paths

For economical treatment of dirt and gravel roads and paths, where it is desired to lay the dust and protect the surface with an Asphaltic mat, Socony Liquid Asphalts are produced in different grades to meet particular requirements. Socony Liquid Asphalts are usually applied in amounts varying from ¼ to ½-gallon per square yard and require a cover of sharp sand or clean gravel.

MAIN ENTRANCE TO THE UNIVERSITY OF BUFFALO, CONSTRUCTED WITH SOCONY ASPHALT PRODUCTS

For Repairing Road and Path Surfaces

Socony Cold Patch Asphalt is an ideal patching material for repairing holes, ruts and depressions in all types of bituminous road surfaces. It is equally effective for restoring worn, uneven surfaces of brick and wood block pavements.

For each cubic yard of ½-inch to ¾-inch dry stone, we recommend the use of about 16 gallons of Socony Cold Patch Asphalt. Socony Cold Patch Asphalt is used without heating and is workable the year round.

For Filling Joints of Brick and Concrete Pavements

Socony Asphalt Joint Fillers for filling the joints of brick and concrete pavements are specially refined Asphalts of high melting point. They are either poured or squeegeed into the joints, and produce a rigid, noiseless and easily repaired pavement.

THE STEWART IRON WORKS COMPANY

Incorporated

Iron Fence, Chain Link Wire Fence and Ornamental Iron and Wirework

728 Stewart Block, Cincinnati, Ohio

PRODUCTS

- Arches for Gateways
- Area Gratings
- Balcony Railing
- Basement Window Guards
- Bracket Lanterns
- Bridge Railing
- Cashier's Cages
- Cashier's Wickets
- Cellar Doors
- Chain Link Wire Fence
- Coal Chute Doors
- Counter Railings
- Folding Gates
- Fireproof Safes
- Grilles
- Gates for Stores, Banks and Offices
- Iron Fence
- Iron Reservoir Flower Vases
- Jail and Prison Work
- Lamp Standards
- Lawn and Garden Fountains
- Motor Truck Bodies
- Porch Railing
- Public Drinking Fountains
- Settees and Chairs (Iron and Wire)
- Stair Railing
- Steel Shutters and Doors
- Sidewalk Gratings
- Vault Doors
- Window Guards (Iron and Wire)
- Wire Counter Railing
- Wire Partition Railing
- Wire Fence (Chain Link)

FACILITIES

This company, "The World's Greatest Iron Fence Builders," has unsurpassed facilities for the manufacture of any of the products listed above. These facilities comprise a factory containing 350,000 sq. ft. of floor space and covering 8 acres; an equipment of modern machinery; skilled workmen and a complete organization of engineers and draftsmen. This, together with over 45 years of practical experience in this line, insures the highest standard of work, prompt service and reasonable prices.

IRON FENCES AND GATES

This company specializes in the building of high grade plain and ornamental wrought iron fences and gates, light or heavy, for schools, playgrounds, parks, etc. They are constructed either from designs of its own draftsmen or from drawings and specifications submitted by customers. From its experience, the company is qualified to advise as to the type of fence best adapted to particular conditions and to aid in the most satisfactory and economical solution of fencing problems.

For the front approach and lawns of the well-planned school premises nothing can take the place of a high-grade, well-designed Wrought Iron Fence. Such a fence can be erected to any reasonable height, and will be as nearly non-climbable as a fence can be made. A wide variety of tasteful designs are available which create that atmosphere of dignity and permanence which should always be inseparable from any public institution.

THERE IS SUBSTANTIAL BEAUTY IN STEWART WROUGHT IRON FENCE AND GATES FOR SCHOOL FRONTAGES

Section V

BUILDINGS AND EQUIPMENT FOR PHYSICAL EDUCATION AND PLAY

Some Essentials in Playground Planning

BY ERNST HERMANN

PLAYGROUND PLANNER AND SUPERINTENDENT OF PLAYGROUNDS, NEWTON, MASS.; DIRECTOR, SARGENT SCHOOL OF PHYSICAL EDUCATION, BOSTON UNIVERSITY

WHEN play is used as an educational force, we think first of all of its mental significance, next of its physiological influence in the development of physical health, and finally of its power in developing social and civic virtues. In planning a play and recreation system it is important to remember that play and recreation are personal matters. Every community has its own individuality, and no standard recreation system can be designed which will effectively meet the needs of every city and town.

Rule 1: *Consider Local Needs*

We may standardize forms of play, games, sports and the physical equipment which they require. We may agree on standard sizes and types of play areas, and we may formulate standard rules to govern playground layouts and designs in order to get maximum and optimum returns. But a play and recreation system must be adapted to local needs, and local needs are conditioned by local groupings, municipal organization, natural resources, topography, climate, and predominating business and other institutional developments.

All these factors should also be taken into consideration when the site for an individual playground is selected. Too frequently they are neglected, and planning a playground becomes a matter of merely making the best of the size, shape, topography, and other natural handicaps or advantages of an available area, with little thought given to the needs of the neighborhood.

The Value of Hills and Brooks Depends on the Size of the Playground

Brooks, hills, trees, ponds, and rock ledges may be great assets in a neighborhood playground of from fifteen to twenty or thirty acres, but the same conditions in a ten-acre lot may prevent the laying-out of any kind of regulation playing fields. I do not want it inferred that brooks and hills and rocks on a ten-acre or even a smaller lot would absolutely prevent the laying-out of a useful and attractive playground. There are few natural handicaps which modern engineering skill cannot overcome, since we can and do blast away rocks, remove hills and cover up brooks. But the cost is frequently prohibitive, at least so far as present-day appreciation of the value of any playground is concerned in almost any American city. Yet in Newton, Mass., in order to gain playing space and to eliminate danger and handicaps to various kinds of ball play, we recently spent $40,000 to build a concrete viaduct in order to eliminate an open brook on a five-acre playground.

Rule 2: *Plan for the Future*

One of the most important rules which every city and town must learn is to plan for the future. Look twenty-five to fifty years ahead. Calculate where open spaces must be preserved, and on or near such calculated spots buy land for park and playground purposes. If you buy over fifteen acres, even a hill and a few acres of swamp land or a brook or some ledges may become an asset. If, however, you desire a twenty-acre athletic field for a high school accommodating 1,500 to 1,800 boys and girls, you should look for level land, because all our standard athletic games and sports need level playing fields.

Newton placed three fine school buildings—a classical, a technical and vocational, and a general building—on a 23-acre lot. The entire lot was not bought at the same time. First the Classical High School was built, and then a small athletic field was acquired by gift. Next to this the Technical High School was erected. Then the city bought more land for another building and for a real athletic field. This was done in response to the best modern education maxim: "Athletics for all, not only for the varsity teams."

Unfortunately, in the middle of the athletic field plot was a hill, approximately 150,000 cubic yards of gravel above the otherwise level field. The hill was covered with beautiful trees. It was necessary, however, to provide three football fields, two girls' hockey fields, four baseball diamonds, a quarter-mile running track with a 220-yard straightaway, eight tennis courts, and many other game courts and places for field events. Therefore, we removed the hill, and used

the cut for filling elsewhere. The cost was worth it.

Ten, twenty, and thirty years ago I made a number of prophecies, which have come true. I will repeat them again at this time:

The American people must have, and will have, playgrounds and recreation parks. If a city or town does not make an immediate survey of its needs, if it does not calculate the growth of its population and its direction for the next twenty-five or fifty years, and now, or as soon as possible, acquire open and suitable spaces, the cost of the space the people will need and will demand will double and quadruple, or more than quadruple, every ten to fifteen years.

The Five Types of Playground

In America we have five generally accepted types of playgrounds: (1) The *play lot,* 6,000 square feet, for children of pre-school age—if possible, one in every block; (2) the *neighborhood playground,* 6 to 10 acres—every quarter-mile; (3) the *district playground,* about 20 acres—every mile; (4) the *recreation field,* not less than 30 acres—one for every 15,000 inhabitants; (5) the *recreation park,* not less than 75 acres—one for every 50,000 in a city. These areas are, I believe, reasonable and attainable in all new municipal expansion. Much can still be done in the old districts of our ever-changing American cities. Such a program requires, of course, the desire and the will to make city life normal again. I personally am convinced that the wisest future Americans will want to live much closer to nature than we do. I believe that they will use the city for business only, and that they will live outside if they cannot find homes with natural settings within the city.

Rule 3: *Athletics for All*

Another general rule to follow in playground planning is not only in the interest of our schools and the education of children, but of economy. Physical education—education through play, education for leisure and for good recreational habits—is becoming a recognized function of the public schools. The value of athletics and sports for all is beginning to be recognized in every progressive school system.

Physical training is no longer thought of merely as a means for promoting physical health during the growing years or as a therapeutic method of maintaining or recovering physical well-being, but it is rather *the principal means of education for complete and successful living.* Every school must therefore have playgrounds and other laboratories for a great variety of physical tasks. It was for this reason that we formulated some years ago a standard for American school playgrounds as follows: for every grammar school accommodating from 400 to 500 children, not less than 6 acres; for every junior high school with 500 to 700 children, not less than 10 acres; for every high school of 1,200 students, not less than 20 acres. These standards were accepted by the National Recreation Association about six years ago, and they are being met by most progressive cities, and in many cases are being exceeded.

Rule 4: *Plan for Community Use of Playgrounds*

Present recreation standards are another reason why we must not only look farther ahead in city planning, but also plan for a wider use of school playgrounds. We must not continue to make the same mistake we have made and are still making, in planning school buildings only for school use, and school playgrounds only for school children, to be used only during school hours. A very much larger use can be made of school buildings and of school playgrounds if both are planned on an overlapping and extending basis of use by the neighborhood. If properly planned and properly constructed, adequately maintained, and intelligently supervised, such a plant becomes the most efficient and economical agency for social progress in any community. It is therefore important to develop cooperating and coordinating agencies for the efficient development of facilities for recreation, that most important branch of social and civic welfare.

I do not hesitate to make the statement that well-planned and well-run playgrounds are the greatest real estate asset a city has. This will become increasingly the mark of progressive cities and efficient municipal government. Our children and our children's children will judge us by the extent to which we have preserved and enhanced our natural resources.

The Improvement Since Our First Playgrounds

We have learned a great deal since our first ugly dumps of playgrounds were started some forty years ago. They were not only dusty, ugly dumps, but were so filled with apparatus that they looked like monkey cages. This terrible stage, now happily passed, grew out of the intense desire of play-pioneers to give the children in crowded cities opportunities for active play. Any vacant lot seemed a godsend, and since climbing trees, overcoming obstacles, sliding, jumping and vaulting have biological significance, our pioneers thought children needed all kinds of fancy structures. To be sure, such monkey cages have their value, but true play and recreation involve much more than mere anatomical or physiological exercise. Play must reach the heart and soul of the child, and children naturally love beauty and nature. A playground without grass, shrubs, trees, vines, and flowers is not a real playground and does not refresh the soul of dwellers among bricks, stone, steel and mortar.

Rule 5: *Have a Landscape Setting*

This suggests another fundamental principle which the playground planner must bear in mind: A playground to be a success must have a beautiful and effective, yet economical, landscape setting. We need green fields and the green background of hedges, bushes and trees to rest the eyes from the glare of our white-paper occupations and the increasing eyestrains which result from close-up work and study. We need trees to deaden the noise without and within the playground, and we must have shade for rest and the enjoyment of quiet games and other forms of constructive play and recreation. We need an oasis in the desert of the modern city. We must keep out ugly sights and noise, and give our girls and boys a chance to play with abandon each in their own play world.

Space Should Be Provided for Games for Different Age Groups

For this we need not only the most skillful landscaping and the enhancement of natural settings, but in addition we need a layout which preserves the largest possible area for games and sports. The arrangement must offer opportunities for natural groupings for children and young people of various ages, and should even provide for adults. It must allow for overlapping and seasonal uses. Such a layout demands the judicious use of fences and walls, of benches, tables, etc., and it involves permanent reservations for little children and for girls. Fences should be installed for the protection of the players, backstops for the promotion of the best possible play, and ground surfaces to make active play safe and scientific.

Baseballs which fly into little children's play fields or into streets or neighbors' yards may cause accidents, do damage to passing automobiles, encourage law breaking, and—what is even worse from the aspect of baseball—spoil the game. If our tennis players must chase their balls because inadequate backstops—or none—are provided, we shall have no real players either now or in the future. If it is necessary to hunt through shrubs and bushes and climb over inadequate fences, we shall have no orderly and beautiful landscape settings.

Fences Are Important

In determining the size of a playground, one must plan to use eight to ten per cent of the area for a landscape setting, particularly in the case of playgrounds of from thirty or fifty acres. Well-defined entrances, walks, service drives, shrubs, trees, lawns, special surfaces, etc., are all of great importance if we are to receive worthwhile returns in play and recreation and in mental, moral and social health and happiness. Fences for the grouping and protection of players and for the preservation of natural settings are imperative. The skilled architect will see to it that the prison effect of some types of fencing is avoided in the future.

Generally speaking, picket fences outside, high wire fencing inside, all kinds of garden fences where needed, must be made more or less attractive by shrubs, flowers and trees, vines, etc., and are a most important part of playground design.

Playground Planning Demands the Cooperation of Experts

When we consider that there must be special areas for little children, resting places for mothers, special divisions for certain games for young women, special game courts, suitable placing and setting for apparatus, safe approaches to different sections, central control, proper field houses, sanitary accommodations, drinking fountains, surface drainage, easy supervision, it can readily be seen that playground planning is a combination job for an engineer, an architect and a play and recreation expert. Since playground construction is a costly affair under such various requirements, it is further evident that no playground construction should be undertaken until complete plans have been carefully studied by a specialist.

A great deal of money has been wasted where construction was started without complete designs. For instance, I have emphasized several times the importance of trees. Trees grow slowly. It costs quite a bit of money to transplant a 20-foot tree. Yet many trees are being set out annually which later on prove to be in the wrong spot. Since many of our playgrounds, particularly in cities, have to have landscape settings built up, it will take years before the playgrounds will gain real beauty and attractiveness. Time and again I have seen trees set out on the south and west side of tennis courts, and none on the north side. When these trees are twenty feet high it will dawn upon the authorities that the flickering shadows from these trees spoil the play.

The Best Possible Conditions Should Be Provided

To promote wholesome play and love for sports, we must have the best possible conditions. You cannot develop a skater on soft ice, nor a tennis player on "cuppy" tennis courts. You cannot play baseball with the sunlight toward the fielders. The details of layout and construction are more important than most architects realize or many maintenance departments yet understand. The landscaper must remember that utility comes first, and the playground directors must remember that landscape settings are also of extreme importance in the efficiency and in the economy of the care and supervision of playgrounds.

Desirable Features in New Swimming Pools

THE four swimming pools illustrated in these pages indicate the type of pool which is now being built by up-to-date schools and colleges. Large colleges and universities often have several pools of regulation size, or one large pool which can be subdivided to provide space for instruction, team practice, etc. Separate pools for these purposes, however, are recommended.

Improvements in Standards and Construction

Standards of swimming pool construction and sanitation are improving. Architects and engineers are giving more attention to the choice of suitable materials and equipment, as well as to the planning and design of natatoriums. Builders know that there is now no excuse for pools which leak, for walls which crack or for ceilings which echo every sound. They also realize that the location of pipes, filters, heating and ventilating systems, showers, dressing and locker rooms and spectators' galleries affect not only the sanitation, convenience and enjoyment of a pool, but also its economical upkeep and maintenance.

In the case of pools which supply swimming suits, provisions should be made with a laundry for daily collections of the suits, or else for washing, sterilizing and drying them on the premises so that they do not remain wet long enough to rot or mildew. (For a discussion of the laundry equipment needed, see the article on "The Laundry Problem of Schools and Colleges" in Section VIII.)

Showers and dressing rooms should be adjacent to the pool so that swimmers need not cross any corridors after taking their showers preliminary to entering the water. In order to keep the floors clean, it is essential that no one wearing street shoes be allowed to enter the shower room or the walks around and leading to the pool. It should not be possible for spectators to enter these places.

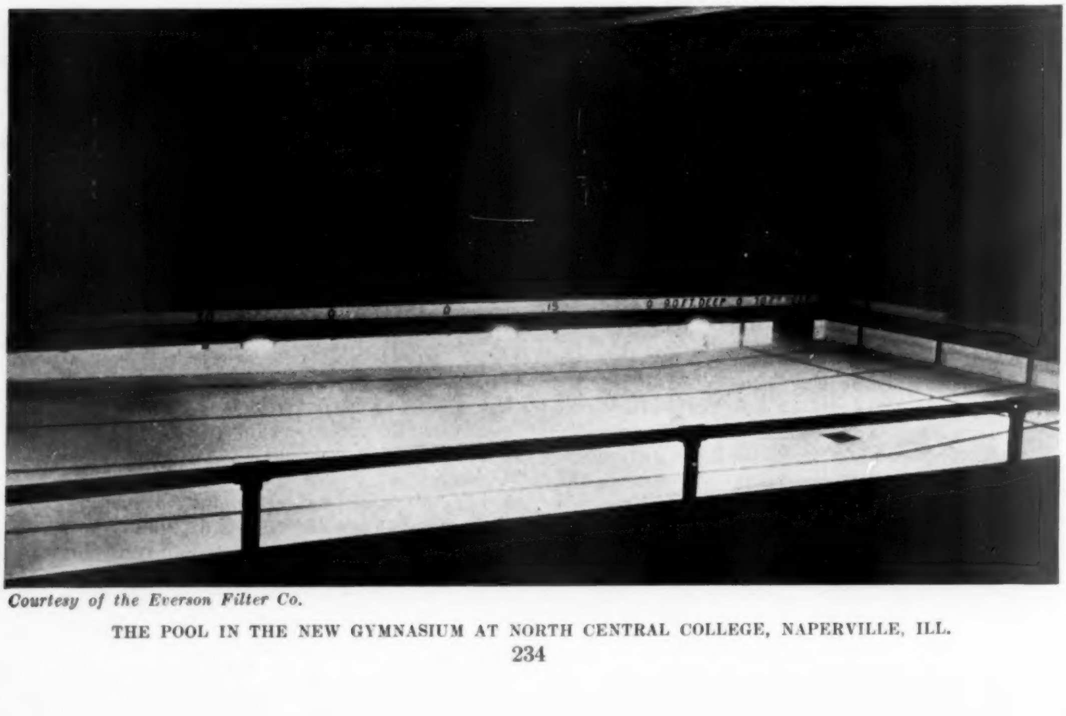
Non-Utilitarian Factors Considered

Consideration is gradually being given to psychological factors in planning natatoriums. Pools which admit sunlight and glimpses of the outdoors, which have space around and above the swimming tank, and which use color to vary the monotony of white tile, are cheerful and inviting as contrasted with many older pools, which were generally built in basements and resembled tombs.

The deafening effect of sounds in swimming pools can be avoided by acoustic treatment of the ceiling. Many people often think of pools as stifling places, not only because of the necessary high temperature of the room, but because of the odor of chlorine. This objection can be met by proper ventilation, which involves circulation of the air. For the protection of swimmers, all the radiators and steam pipes should be recessed in the walls.

Under Water Lighting

The submarine lighting of pools is a development which seems likely to become increasingly important. With under water lights, it is possible to avoid glare in the room. And entirely aside



Courtesy of the Everson Filter Co.

THE POOL IN THE NEW GYMNASIUM AT NORTH CENTRAL COLLEGE, NAPERVILLE, ILL.

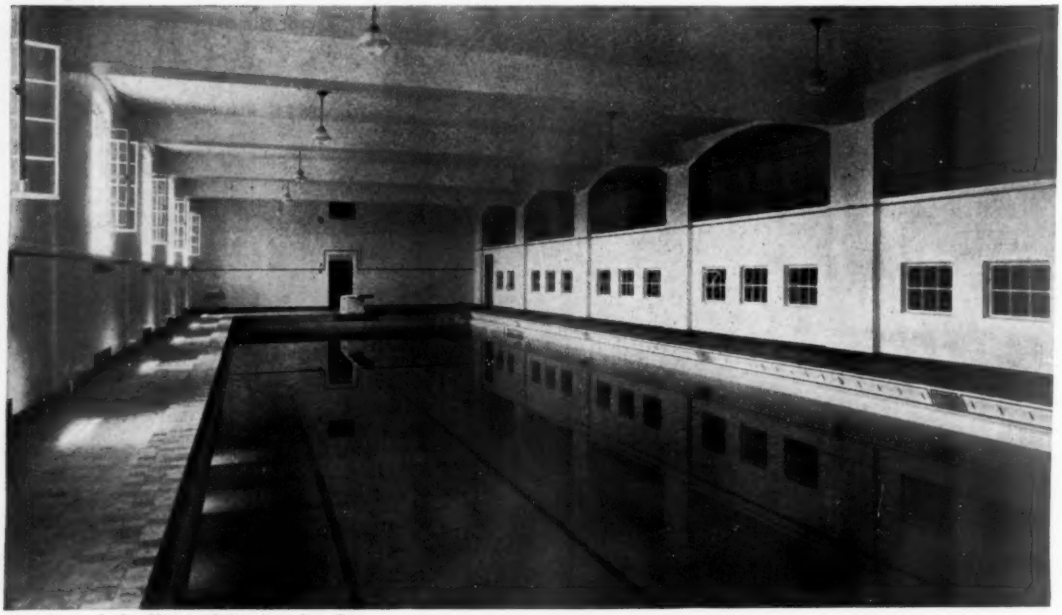
Courtesy of the Swimming Pool Construction Co.

PLENTY OF SUNLIGHT MAKES THE POOL AT THE COLLEGE OF MT. ST. VINCENT, MT. ST. VINCENT-ON-HUDSON, N. Y., A CHEERFUL PLACE ALL DAY LONG

from the fact that spectators find it thrilling to watch events in a pool in which the only illumination comes from beneath the surface of the water, lighting of this type increases the safety of the pool. A swimmer can be seen clearly from any angle, irrespective of the depth to which he is submerged. Any one in difficulty can be seen immediately and given the necessary assistance.

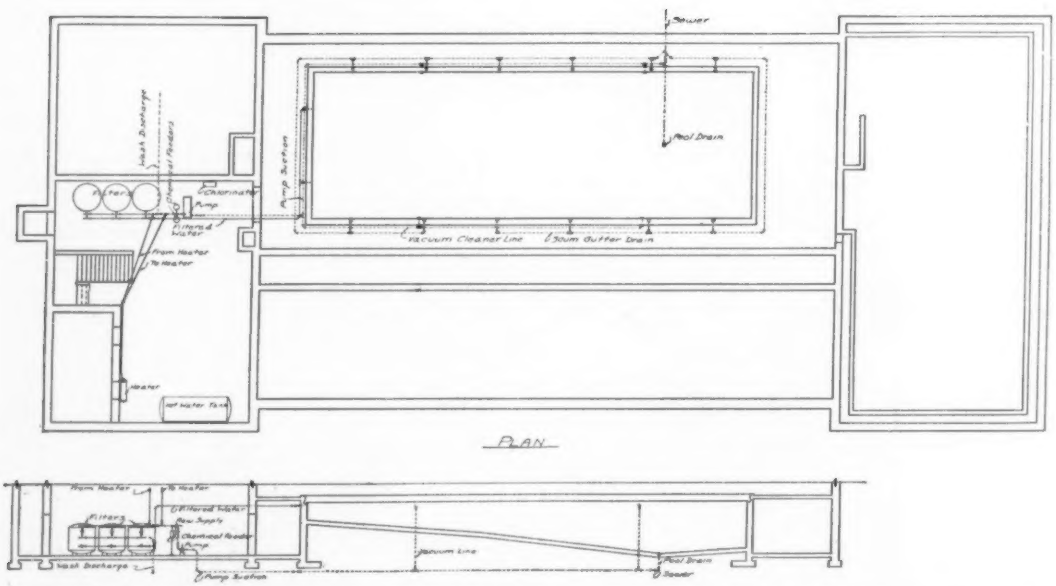
Courtesy of the Roberts Filter Co.

AN OVERHANGING BALCONY IS PROVIDED FOR SPECTATORS AT THE PRESBYTERIAN COLLEGE POOL IN CLINTON, S. C.



Courtesy of the Norwood Engineering Co.

THE SPECTATORS' GALLERY OF THE POOL AT WILLISTON ACADEMY, EASTHAMPTON, MASS., IS OVER THE CORRIDOR



THE PLAN AND CROSS-SECTION OF THE SWIMMING POOL AND FILTER PLANT OF THE WILLISTON ACADEMY GYMNASIUM

The filter equipment consists of three 54"-diameter vertical steel pressure filters connected in battery with cast-iron flanged interconnecting piping. Each tank is equipped with a standard cast-iron manifold system, bronze strainer system, sand and gravel, inlet pipe and overflow funnel. With the filter equipment a chlorinator and a pump and motor were installed. A hair and lint catcher was attached to the pump discharge, as well as venturi tube and heater connections. The venturi tube is connected to two chemical feeders

A New School Athletic and Students' Activity Building

Williston Academy, Easthampton, Massachusetts

BY JAMES H. MACNAUGHTON

ARCHITECT, BOSTON

THE new Athletic Building at Williston Academy, Easthampton, Mass., includes not only a gymnasium and a swimming pool but also rooms for many school activities. In preparing the early studies for this building, the architect visited most of the private school and college athletic buildings in the East, talked with physical directors and those in charge, and gathered a great deal of valuable information which proved helpful in working out the final plans for the building.

The Plan of the Building

The building is H-shaped, one wing being devoted chiefly to student activity rooms, while the other contains rooms for special athletics, supplies and the physical director's offices. The gymnasium proper connects the two wings on the first floor, and the natatorium and squash courts are underneath the gymnasium on the ground floor.

The building is of red brick, Colonial in style. It is so located that the front elevation, which faces the campus, is two stories high, while the opposite elevation, facing the athletic field, is three stories in height, allowing ample air and light to the ground floor. Floors and partitions are fireproof, of reinforced concrete and terra cotta block construction.

The Ground Floor

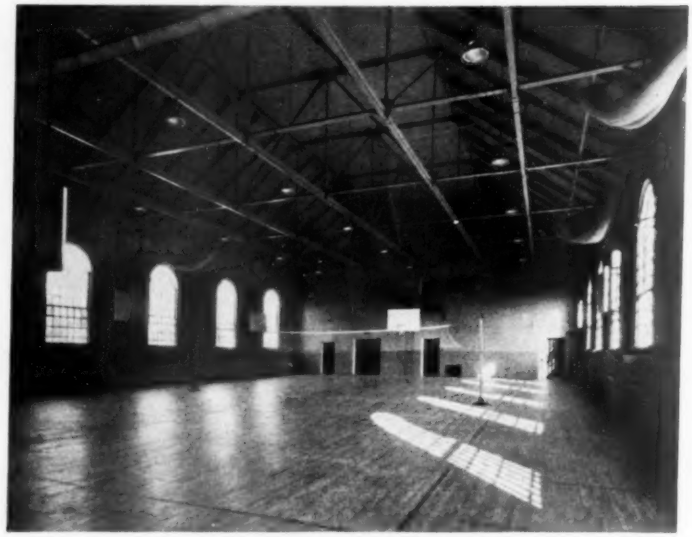
The ground floor contains the swimming pool, 25 feet x 75 feet, in a natatorium 36 feet x 98 feet; three standard size squash courts; locker rooms, shower rooms, rubbing rooms and toilet rooms, including locker rooms and showers for visiting teams. Between the natatorium and the squash courts, a corridor connects the two wings, over which is a spectators' gallery which serves for both the swimming pool and squash courts. The natatorium, shower and rubbing rooms have tile floors, and walls 7 feet high. At the rear of the building are entrances and exits so that the students may go from the locker rooms directly out of doors to the athletic field.

The First Floor

The gymnasium, 60 feet x 98 feet, is two stories high and has a clearance under truss of 22 feet. On the first floor are also a spacious lounging room with a fireplace; a serving room equipped so that refreshments can be served in either the gymnasium or the lounging room; and a ladies' parlor which is used chiefly by visitors to the school. In the opposite wing on the same floor are the physical director's office and examination rooms, a storage room for apparatus, supply rooms, etc.

The physical director's office is so located that he has complete view and control of the gym-

nasium at all times. The latter is planned so that by the use of dividing nets, three basket-ball practice courts can be used simultaneously. A portable stage, a proscenium arch and scenery are provided. In both the swimming pool and the gymnasium the radiators are concealed in the walls, thereby eliminating the danger of injury or burns to the players.



THE GYMNASIUM

The Second Floor

Rooms on the second floor of the athletic wing are used for boxing, fencing, wrestling, and corrective physical education. The other wing has rooms suitable for meetings of such organizations as the dramatic club, musical clubs, and the *Willistonian* Board, which publishes the weekly school paper. There is an exhibition room for the display of loan exhibits of paintings and sculpture and for student work, as well as historical records of the school.

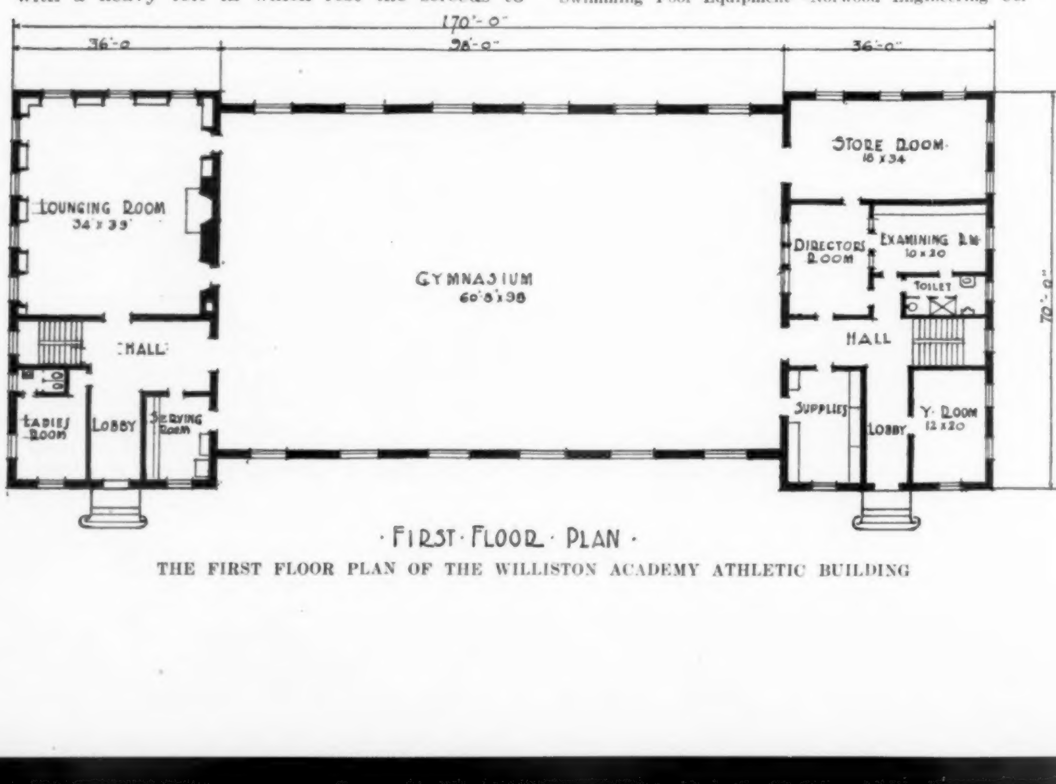
Acoustics

In planning the gymnasium and swimming pool, considerable thought and study was given to acoustics. The underside of the roof of the gymnasium is covered with acoustical tile, which not only deadens sounds, but at the same time protects against extreme temperatures outside. The system of flooring used in the gymnasium also insures silentproofing as far as possible. Over the concrete slab, steel chairs are placed, lined with a heavy felt in which rest the screeds to which the finished floor is laid. This gives a very resilient floor and is considered almost ideal, as it markedly lessens fatigue.

The ceiling of the natatorium is treated in a similar manner to that of the gymnasium, eliminating echoes and the noise which is so prevalent in the average natatorium.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Acoustical Treatment—Celotex Co.
Cleaning Equipment—Spencer Turbine Co.
Drinking Fountains, Plumbing Fixtures, and Sanitary Equipment—John Douglas Co.
Gymnasium Equipment and Furniture and Lockers—Narragansett Machine Co.
Lighting Globes and Fixtures—Holophane Co.
Partitions, Shower and Toilet—Hart & Hutchinson Co.
Shower Mixing—Leonard Co.
Swimming Pool Equipment—Norwood Engineering Co.



·FIRST·FLOOR·PLAN·

THE FIRST FLOOR PLAN OF THE WILLISTON ACADEMY ATHLETIC BUILDING

Equipment for Physical Education in City Public Schools

By MARIE M. READY
Associate Specialist in Physical Education,
U. S. Office of Education

THE value of providing adequate facilities and equipment for carrying on a well-balanced program of physical education as an essential part of an educational program is generally recognized by educational authorities throughout the country. The wisdom of planning and providing facilities which are accessible for after-school and Saturday activities for children, as well as for community recreation for adults, is beyond question. Skillful planning of layout and equipment is required in order that the best possible results may be secured for children of all ages and grades.

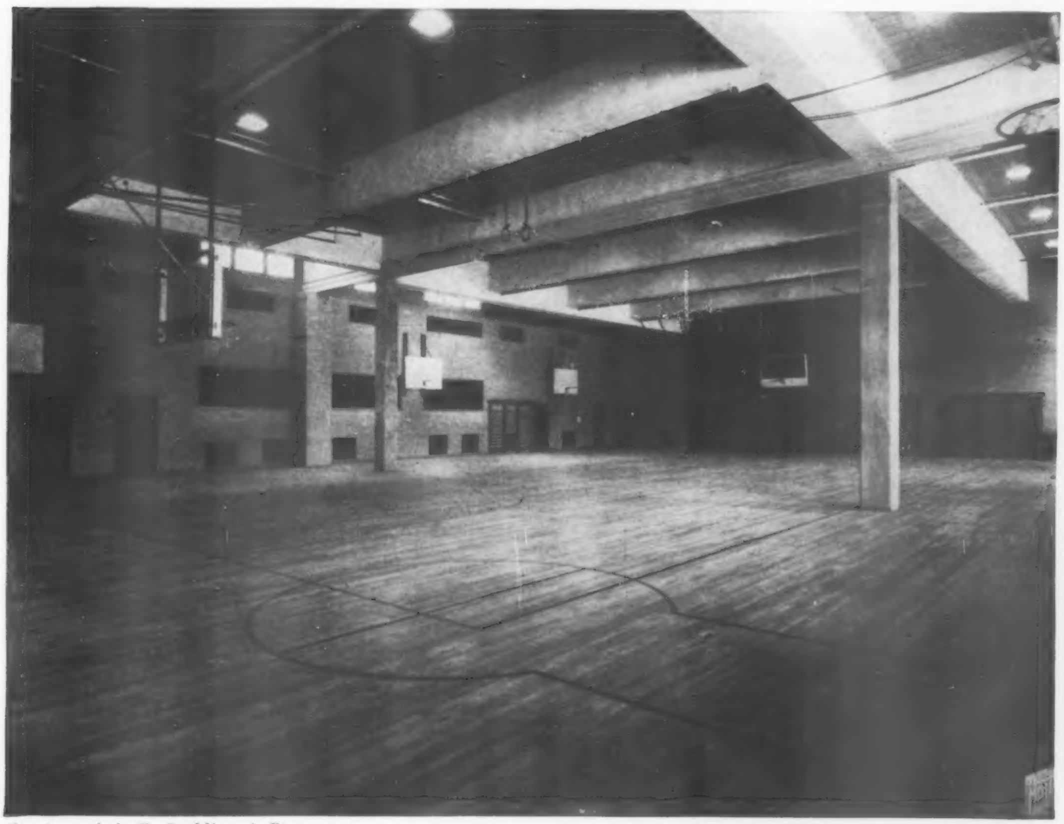
Among the indoor and outdoor facilities which should be considered in connection with a program of physical education in city public schools may be mentioned gymnasiums, playrooms, swimming pools, school playgrounds and athletic fields. Attention should be given to the construction and equipment of these facilities, bearing in mind the advantage of planning a program which includes opportunities for enjoying seasonal activities, games and sports, such as coasting, skating, swimming, hiking, scouting and camping.

Four general grade groups should be considered in planning both indoor and outdoor facilities:

a. The primary grades
b. The intermediate grades
c. The junior high grades
d. The senior high grades

Gymnasiums Should Be Provided

Gymnasiums should always be provided for high schools and junior high schools. If the total en-



Courtesy of A. G. Spalding & Bros.

Plenty of free space is desirable in a gymnasium. Folding doors in the John Hay High School Gymnasium, Cleveland, Ohio, make it possible to provide separate gymnasiums for girls and boys. The full gymnasium will accommodate 1,500 spectators. Portable bleachers are used.

rolment is more than 700, there should be two gymnasiums, one especially equipped for girls and one for boys. If the enrolment is small and only one gymnasium is required, provision should be made for separate dressing-rooms, showers and lockers for boys and for girls. For boys, gang showers may be provided. For girls, individual showers and dressing-rooms are recommended.

In elementary schools a gymnasium offers the best opportunity for carrying on a well-organized program of activities. It is highly desirable that a gymnasium be provided for the intermediate grades and the primary grades. If this is impossible, however, a large playroom with sufficient space for folk dancing and running games should be provided, and the classrooms should be equipped with movable desks.

The Size of Gymnasiums

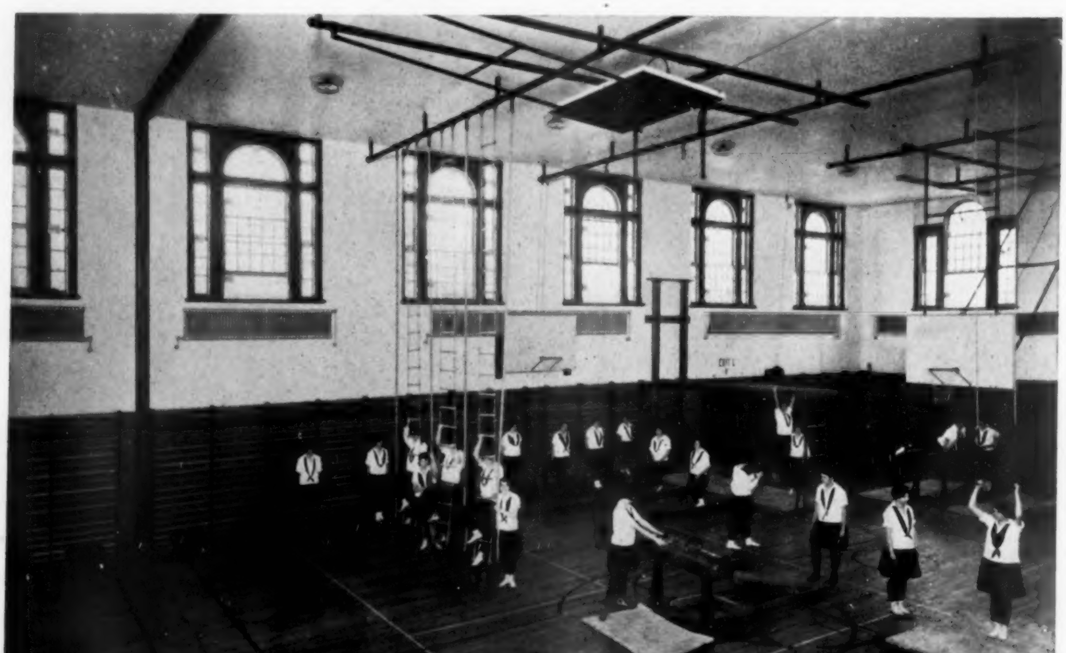
Definite recommendations regarding the size of gymnasiums have been made by the departments of education in several states. In Alabama and Pennsylvania the minimum requirements specified for the floor of a gymnasium for the smallest school are 41 feet by 66 feet, with a height of 18 feet. In Pennsylvania it is recommended that a very large gymnasium be provided and that a folding partition be used for separating it into two gymnasiums.

In view of the present emphasis given to games as an essential part of a program of physical education, it is desirable to provide plenty of free space in a gymnasium. This should be unobstructed by heavy, unwieldy apparatus which requires considerable time for moving.

Equipment in Elementary School Gymnasiums

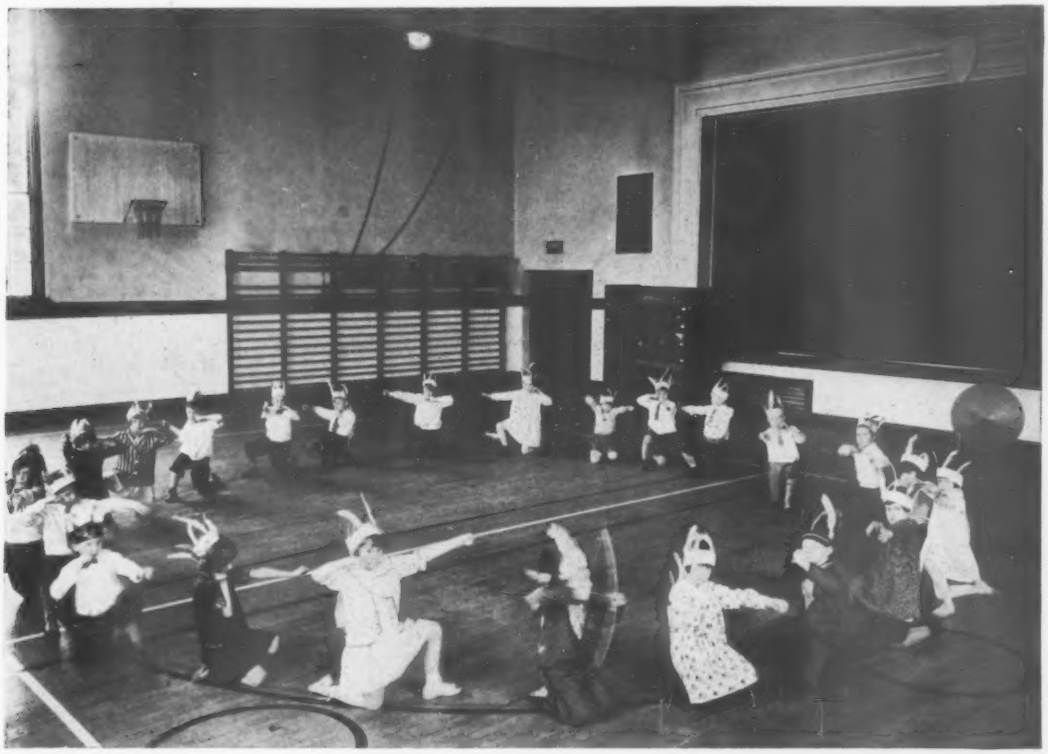
For the elementary school gymnasium, especially light apparatus should be provided. There should be tumbling-mats, climbing-apparatus, balance beams, horizontal bars, jump standards and cords, a few Indian clubs for relays, playground bats and a few wands for simple games. A portable victrola is helpful, although a piano and a well-trained pianist are especially desirable for rhythmic exercises and dramatic rhythms.

The floor space should be marked for games such as dodge-ball, volley-ball, paddle tennis, and playground ball, and the wall space may be especially distributed for ball practice. Special cabinets should be provided for the apparatus.



Courtesy of the Narragansett Machine Co.

THE GYMNASIUM IN THE HIGH SCHOOL AT SCARSDALE, N. Y.



A PRIMARY SCHOOL GYMNASIUM CLASS ACTING OUT AN INDIAN STORY PLAY
As directed by radio by Mrs. Alma C. Ruhmschussel, "The Smile Lady" of the Ohio School of the Air

Equipment in High School Gymnasiums

Various kinds of equipment and apparatus should be provided for the junior high and senior high school gymnasiums. Among these may be mentioned tumbling-mats, springboards, jump standards, adjustable horizontal bars, incline springboards, baseball bats, and basket-ball standards. A punching-bag may be included in a boys' gymnasium. The provision of a large number of balls for the various kinds of ball games affords considerable opportunity for practical exercises by all the children in handling the various types of balls.

The provision of mat trucks, not only for the elementary school gymnasium, but also for the junior high school and senior high school gymnasium for girls, is desirable. The use of these trucks is helpful in saving time when moving the mats as well as keeping the mats in a better sanitary condition.

In general, a generous supply of balls and a few pieces of apparatus which may be moved aside for games are a good beginning for gymnasium equipment. Additions may be made whenever desired or needed.

Playrooms

The equipment needed for elementary school playrooms is about the same as that mentioned for the elementary school gymnasium. For the primary grades, however, a specially planned playroom is always an asset. Various kinds of equipment, including bean bags, rubber balls, simple climbing or hanging apparatus, are desirable. Playrooms are especially valuable for rainy-day and recess programs. If equipped with a small movable platform and two side screens, they are excellent for dramatization of story plays. They are especially valuable for quiet games for sickly children. For the latter, the provision of cheerful surroundings is decidedly an advantage.

Swimming Pools

Swimming is perhaps the most popular of summer sports, not only for school children but also for adults. While a number of junior high schools and senior high schools, especially new buildings, have been provided with swimming pools, as yet only a small number of pools have been provided for elementary schools. The cost of constructing and maintaining indoor pools is somewhat high in comparison with the cost of provision of other recreation facilities. Outdoor pools may be constructed and maintained at a more moderate cost.

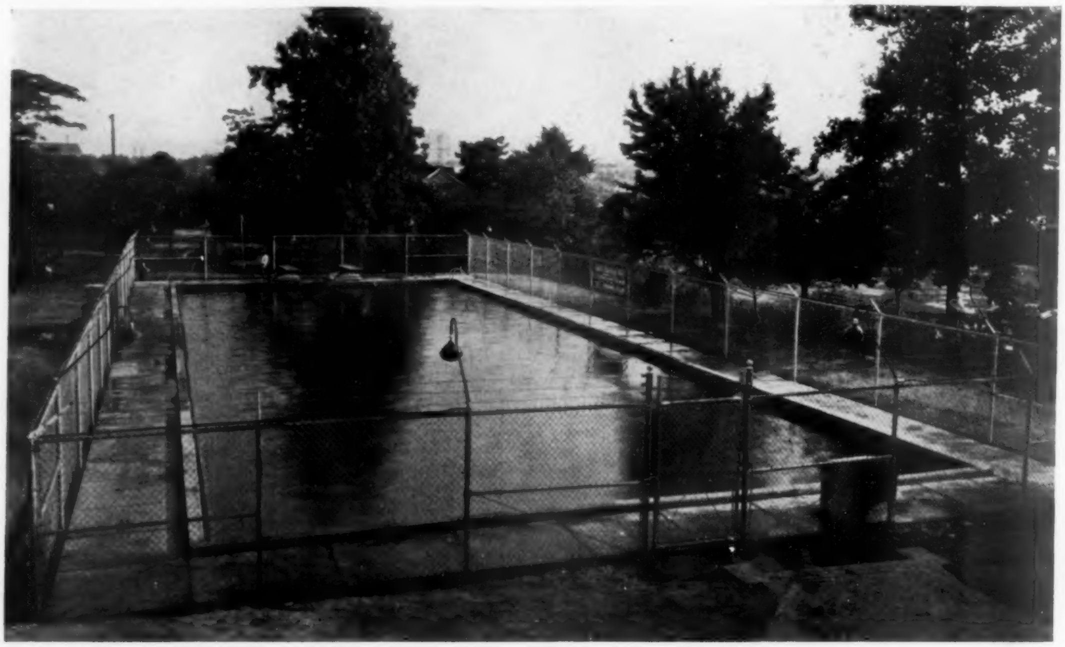
There is a growing tendency to provide for the teaching of swimming during the summer as a seasonal activity. In some cities, boards of education are cooperating with recreation and park

commissions in promoting an extensive use of outdoor pools, not only for the school children but also for the entire community.

For the construction and maintenance of indoor or outdoor pools, adequate funds should be provided for the equipment needed to maintain a proper standard of purity of the water and to install the other sanitary facilities which the best modern practice requires. It is necessary, also, to provide for adequate sanitary supervision of the dressing-rooms and showers, and it is advisable to have the pools so located in the buildings that they will be easily accessible for school and community use during after-school hours and vacations.

high, and senior high schools. Many boards recommend larger areas.*

Throughout the country state departments of education are rendering assistance in the matter of securing and equipping school playgrounds. In some states the department includes a special division of school buildings and grounds, with a director in charge of the work. In some states also, all plans for school buildings and sites must be submitted for approval to the state department of education. Valuable assistance is often rendered to county superintendents and school principals through special suggestive circulars and pamphlets regarding the construction, layout and equipment of playgrounds.



THE NORTH GRAMMAR SCHOOL SWIMMING POOL, WINSTON-SALEM, N. C.
This pool, 35 x 100 feet, was donated by the Kiwanis Club

School Playgrounds

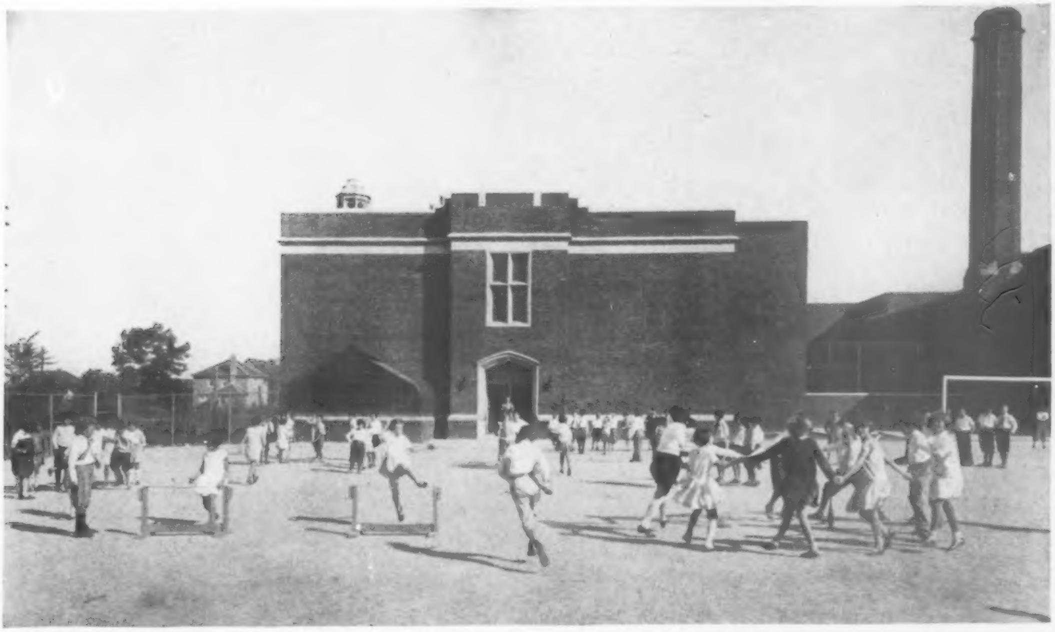
School playgrounds have become recognized as an important part of school and community equipment. Lack of adequate play space, especially for the elementary grades, is considered a serious handicap. In recognition of this need of play space, rules and regulations have been made by state boards of education in twenty states requiring areas of certain minimum size for school sites. Standards for city and rural schools of various enrolments have been drawn up by 36 state departments of education, and more than 60 cities have adopted as a standard 5 acres for elementary schools. The size of playgrounds required by the rules and regulations of state boards of education varies from 1 to 6 acres in the case of elementary schools, to from 2 to 10 acres for high, junior

Playgrounds for the Primary Grades

In planning the layout and equipment of playgrounds for the primary grades, the first problem to be settled is one of location. Unless special areas are set aside, separated from the activities of the older children and protected by supervisors so that accidental or purposeful interference by the older children is impossible, the younger children will not enjoy their facilities to the fullest extent. Benches, hedges or fences are helpful in marking a definite line of separation between the two groups.

Within the special area for younger children there should be a few simple pieces of apparatus for climbing. A Junglegym affords a variety of

* For a discussion of "Some Essentials of Playground Planning," see page 231.

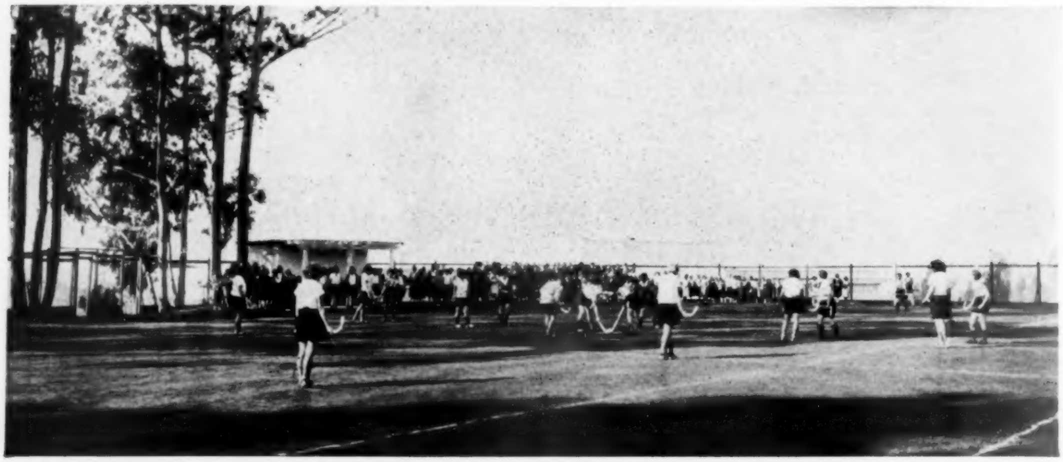


CIRCLE GAMES AND HURDLING ARE POPULAR AT THE HOLLY ELEMENTARY SCHOOL PLAYGROUND, DETROIT, MICH.

opportunities for a large number of children. A play shed lends itself to the spontaneous games of girls, and a crude hut or tent is an inspiration to little boys for their Indian games. There should be a generous supply of bean bags and rubber balls of various sizes.

Photographs by courtesy of the National Recreation Association

THE WEST STREET SCHOOL PLAYGROUND, HOLYOKE, MASS., IS A POPULAR AND BUSY PLACE



THE GIRLS' ATHLETIC FIELD OF THE HAYWARD UNION HIGH SCHOOL, HAYWARD, CALIF.
On top of a beautifully terraced hill, back of the gymnasium, this field provides the necessary seclusion for girls' activities. It is used exclusively by the 350 girls in the High School, and is equipped with collapsible bleachers, a large equipment house and two drinking fountains

It is especially important to reserve adequate open space for folk dancing, running, skipping, bouncing balls, jumping ropes, rolling hoops, simple games of dares, in fact, an infinite variety of tag games and other forms of vigorous play. It is helpful to have certain spaces arranged for the more quiet forms of play, such as marbles and ring the peg.

Outdoor Play Space for the Intermediate Grades

In regard to outdoor play spaces for the intermediate grades, these should include special layouts and some apparatus especially suitable for organized games for boys and girls. It is a good plan to provide for a few essential pieces of apparatus, and to make further provisions as needed. Sets of horizontal bars of varying heights may be provided in several locations, away from the areas for running games. Tether-ball poles may be placed at convenient locations, for play especially at recess and during after-school hours. Playground ball targets, tennis targets, in fact, practice facilities for many games, are very helpful, not only for the instruction period, but also for the practice period in physical education.

Athletic Fields for High Schools

Outdoor facilities for junior high schools and senior high schools should include extensive athletic fields. It is generally recognized that ten to twenty acres are needed to provide for a varied program of games and sports. For senior high schools, special layouts for tennis, baseball, basket-ball, volley-ball, soccer and football should be provided. Layouts for soccer and playground ball are usually provided for junior high schools instead of football and baseball.

For the boys of both junior and senior high schools there should be additional provision for field and track events, including the discus, the shot, and the javelin throw. For the girls, spaces should be provided for the practice of hurl-ball, archery, javelin-throwing and limited track and field events. Layouts for playground ball and volley-ball are suggested for junior high school girls instead of baseball and basket-ball. Provision for hockey may be made for both junior and senior high school girls.

Careful Planning Promotes Health

In general, the facilities provided for in a program of physical education in city public schools should be planned for the greatest benefit to the largest number of children. There should be no skimping in the provision of sanitary supervision. Careful planning and generous provision of these facilities are invaluable in promoting the health and happiness of the children of the nation.

THE ALL-HIGH SCHOOL ATHLETIC FIELD AND STADIUM, BUFFALO, N. Y.

The Accommodations and the Financial Operation of the Buffalo All-High School Stadium

BY CARL H. BURKHARDT

SUPERVISOR OF PHYSICAL EDUCATION, BUFFALO, N. Y.

THE Buffalo All-High School stadium occupies a plot of ground 482½ feet by 592 feet, adjoining the Bennett High School. It was completed in 1929 at a cost of $352,000, not including equipment, and is used exclusively by the eight public high schools of the city. The architecture is a modernistic adaptation of the Romanesque style.

The stadium itself will seat approximately 16,000, including 728 in box seats. The stands are constructed of reinforced concrete throughout, and are faced on the street fronts with face brick and Indiana limestone trim. In order to afford protection for the spectators, the two main stands are covered with a wood roof built over a structural steel frame.

The foyers or entrances to the north and south stands contain the ticket-takers' booths, public telephones and other accommodations. The space beneath the two main stands has been utilized for shower rooms, toilet rooms, first aid, the administrative office, storerooms and two refreshment rooms.

The Press Box Has a Good View of the Field

The press box is extremely well located, being suspended from the roof of the south stand, where it commands an unusual and unobstructed view of activities in any portion of the field. Provisions have been made for telephone communication from the field to the press box, with incoming lines and radio broadcasting facilities.

The field contains a regulation football field or gridiron, two regulation hockey rinks, a quarter-mile track and facilities for straight-away runs or dashes, broad jumps, high jumps, pole vaulting, shot put, etc.

Financial Operation of the Stadium

An admission charge is made for spectators at football games and final track meets in which all schools compete. For many years the Buffalo public high schools have maintained the policy of keeping the price of admission to all their athletic contests well within the reach of school children. The same price of admission is charged for all games held at the stadium, regardless of their popular appeal.

The admission price is 25 cents for students; student tickets are sold only in the schools. General admission, sold only at the gate, is 50 cents. Box seats are $1.00. A copy of the form used for financial reports gives an idea of the Buffalo plan.

The Distribution of Receipts

The receipts from games are divided as follows:

a. Ten per cent of the gross receipts is paid to the Board of Education as field rent. This money is kept in a revolving fund which is used for extra equipment, repairs and the upkeep of the stadium.
b. Thirty cents per 100 persons in attendance is paid for indemnity insurance against personal injury, covering all persons at games except players and employees.
c. All expenses incident to running games are deducted from the gate receipts, including $200 from the gate receipts at each of the games, to pay the annual salary of $2,000 for the custodian.
d. The net gate receipts are divided equally between the schools competing in the particular sport. In the case of football, eight schools share in receipts from each game although only four schools may be competing on any one day.
e. In case of a deficit occurring at the gate, each school in the league pays its equal share although only four of the schools actually played that day.
f. Each school keeps the net receipts (after taking out the field rent and insurance tax) from its own student ticket sale.

1M-9-33

BUFFALO PUBLIC HIGH SCHOOLS
FOOTBALL—FINANCIAL REPORT

BUFFALO ALL HIGH SCHOOL STADIUM ________________193____

____________________________vs.____________________________

____________________________vs.____________________________

SCHOOL TICKET SALE

SCHOOL	Student Tickets at 25 cts.	Receipts	10 per cent.	Tax	Total Expense	Net Receipts	
Bennett							
East							
Hutchinson							
Masten Park							
Lafayette							
Technical							
South Park							
Riverside							
Total							
Comps.							
Total							

GATE

	Number of Tickets	Receipts	10 per cent	Tax	Total Expenses	Net Receipts	Each School's Share
Gen'l Adm. at 50c.							
Boxes at $1.00							
Boxes at 50 cts.							
Total							

EXPENSES

Field Rent— (10 per cent gate receipts)	
Indemnity Tax— (on gate and comps. 35c per 100 persons)	
Officials— (Referee, Umpire, Head Linesman, etc.)	
Help— (Watchman, Ticket Sellers, etc.)	
Footballs	
Total	

RECEIPTS

Gross Gate Receipts	
Total Expense— (field rental and tax, gate, help, etc.)	
Net Receipts	
Each School's Share—OF GATE RECEIPTS (divide net receipts by 8)	

PROFIT OR LOSS AT GATE

SCHOOLS	Each School's Share of Gate Receipts	Field Rental and Tax Student Ticket Sale	Amount Due Each School	Deficit
Bennett				
East				
Hutchinson				
Masten Park				
Lafayette				
Technical				
South Park				
Riverside				

SUMMARY TOTAL

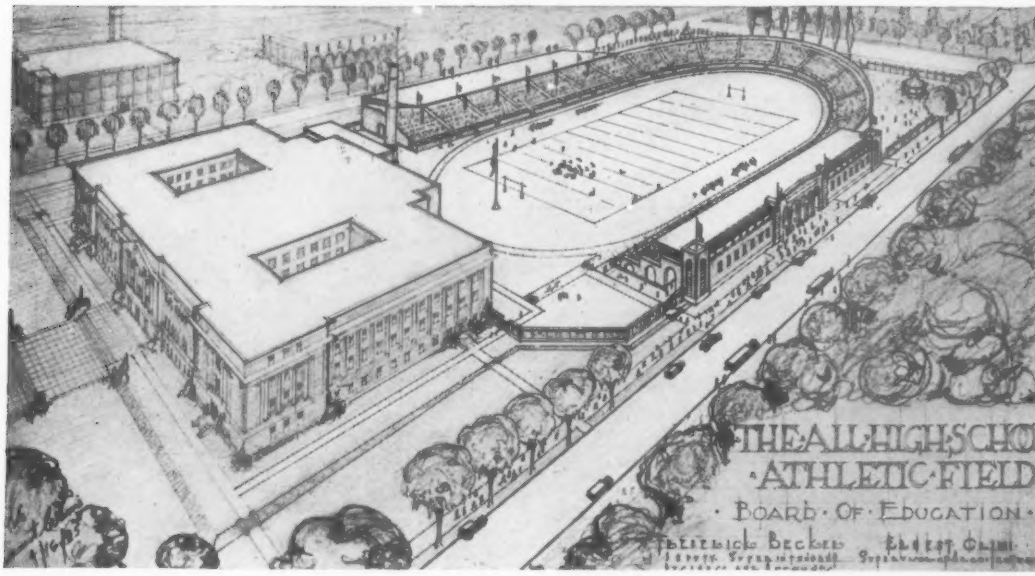
Attendance	Receipts	Expenses	Net Receipts	Field Rent 10 per cent	Indemnity Tax

Winning School	Losing School	Score	Referee	Umpire	Head Linesman

Signed ________________________________

Director Physical Education.

THE FORM USED BY BUFFALO HIGH SCHOOLS FOR FOOTBALL FINANCIAL REPORTS



THE BUFFALO ALL-HIGH SCHOOL STADIUM ADJOINS THE BENNETT HIGH SCHOOL

The Administrative Force Required

The administrative force required for conducting a typical football game and for properly handling a crowd of 10,000 people at the All-High School stadium is as follows:

I. *Game*

a. Three supervisors ....at $5 — $15
Duties: To instruct officials, supervise the teams, supervise the dressing-rooms, assist in supervising the crowd, and enforce the regulation which requires boys to play their own game without adult help or interference during game time and between halves.

b. The regular officials: Referee, $15; umpire, $10; head linesman, $10; and field judge, $5 .... — 40

c. One messenger .... — 3
Duties: To take care of the field telephone, convey the message to the referee when a player is to be withdrawn from the game, and supervise the players' benches.

d. A field doctor, the highest ranking official of the game when a question of the physical fitness of any player is concerned, is furnished for each game through the cooperation of the Buffalo Health Department.

II. *Spectators*

a. Two stand supervisors ....at $5 — 10
Duties: To supervise the stands, see that all workers are doing their work properly, and look out for emergencies such as overcrowding in one section, congestion in aisles, etc.

b. Three ticket sellers, ...at $3 — 9

c. Six ticket takers ....at $3 — 18

d. Ten watchmen and traffic directors....at $3 — 30
Duties: To see that the crowd moves quickly to the sections; to prevent aisle congestion, and to answer questions regarding various sections and seat locations.

e. One head usher .... — 5
Duties: To supervise all ushers, and to settle unusual situations which the regular ushers are unable to settle.

f. Twelve ushers ....at $1 — 12
Duties: To show people to the correct box seat. (All ushers are high school boys.)

g. Office typist .... — 4
Duties: To make each week's mailing list, make the payroll, pay the help, make report forms, tend the stadium telephone switchboard, give information, and do other general office work.

h. Two matrons ....at $3 — $6
Duties: To supervise the women's rest rooms.

i. Financial committee of two members...at $5 — 10
Duties: To supervise the counting of tickets, to check the stile count, and assist the stadium secretary in making out a financial report.

j. The Director of Physical Education, who is also the stadium secretary, is in direct charge of the stadium and of all activities conducted there, makes all schedules, hires all help, plans game details, takes charge of all receipts, pays all bills, and is responsible to the Board of Education for all reports of activities and finances.

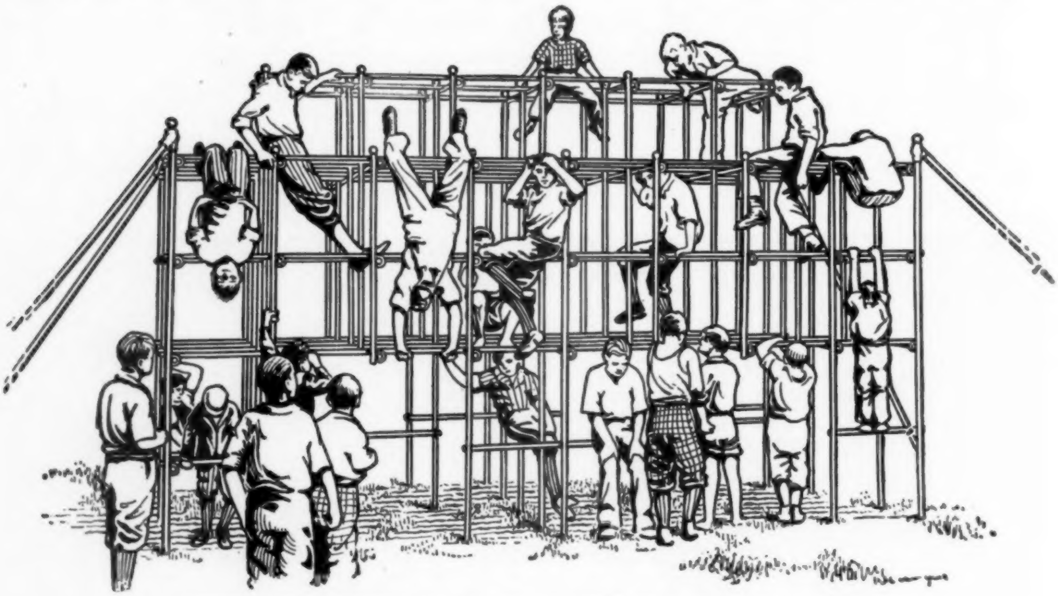
k. One custodian (all year) .... — 2,000
Duties: To inspect the stadium property daily; clean the stadium seats for spectators; clean the dressing-rooms, toilets, rest rooms, etc.; attend to the shrubbery; take care of the field, cut the grass, roll, sprinkle, re-sod and seed the field when necessary; mark the field for football games and track meets; re-surface the track when necessary; look after all equipment; take care of special duties incident to the particular activity scheduled.

Additional laborers are hired as needed during sport seasons at fifty to sixty cents per hour. These laborers are paid by the Board of Education out of the money they receive from the schools as field rent.

The Buffalo All-High School stadium is under the administrative control of the Department of Physical Education. The central office of this department is responsible for all schedules, hiring of all extra help and officials for the conducting of games; it also handles all finances.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Athletic Equipment and Furniture—A. G. Spalding & Bros.
Sanitary Equipment—Crane Co.
Stadium Seating—American Seating Co.
Stonework—Indiana Limestone Co.



THIS IS JUNGLEGYM NO. 1—PRICE $320.00 F. O. B. FACTORY

JUNGLEGYM OWNERS TELL THE STORY

"Has never been an accident. **Think it the safest piece of apparatus made."**—Neva L. Boyd, Director, Hull House, Chicago.

"Retains its popularity after several years of use. **Would sooner part with all the rest of our playground apparatus than with Junglegym."**—C. W. Washburne, Supt. Public Schools, Winnetka, Illinois.

"Requires little supervision. Develops the children physically. **As much interest now as when first installed."**—James V. Mulholland, Supervisor of Recreation, Borough of Manhattan, N. Y.

"Children do not tire of Junglegym. Absolutely safe to play on."—J. S. Wright, Director of Physical Education, Chicago, Illinois.

"We recommend it heartily. **Entirely safe.** Interesting to the children."—Margaret F. Coe, Supervisor Intermediate Dept., The Park School, Baltimore, Md.

"Our little boys like the Junglegym as much as ever."—Edward E. Allen, Director, Perkins Institute for the Blind, Watertown, Mass.

JUNGLEGYM—

Fun No End

Safest Apparatus

Economical

No Moving Parts

JUNGLEGYM, JR., NO. 5
GALVANIZED STEEL PIPE—$125.00
F. O. B. FACTORY

From the very inception of the playground and recreation movement in the United States, Spalding has led in the development and manufacture of apparatus.

Spalding equipment is rugged. "Good enough" will not do—it must be of the highest quality.

Spalding equipment is carefully and scientifically designed. The various pieces are made to be just right for the children who are to use them. Sizes and spaces are correct, materials of full strength with a large factor of safety, design clean to avoid any danger from projecting pieces, bolts, nuts, etc.

PLANS

We offer, without charge or obligation, engineering service on designing complete recreation layouts. It is only necessary to give us all facts available, sketch of grounds with dimensions, and if possible, the topography contours.

PRICES

We are prepared to figure on supplying and installing the complete equipment of apparatus including pipe frames.

If preferred, we will quote on all apparatus and frame fitting of design f. o. b. factory or freight paid to destination. In such case we will supply all necessary erection instructions and blue prints, also complete specifications of galvanized pipe required to construct frames so that you can obtain the correct type and sizes of pipe from local supply houses.

GENERAL OBSERVATIONS

Playgrounds should be placed at points convenient to the children, as, for instance, near to the schoolhouses, assuming that they are properly placed to serve the people most conveniently. Experience has shown that children will not, in any number, travel more than a quarter of a mile to a playground.

Boys and girls should have separate spaces. Fences should be used, one gate entrance to each, to give the director full control. Playgrounds of all kinds should have a trained play teacher in charge, not a policeman or janitor.

The smaller children under ten can usually be counted on to play in one corner of the girls' space. Usually an older sister has them in charge. Also the type of play and games conducted by the girls is safer for the little ones. In this corner we should have a sand pit and a shallow wading pool.

Sanitary bubble drinking fountains should be provided in each of the spaces.

Comparatively few playgrounds are properly shaded. **Trees are absolutely needed** in the hot days of summer if the playground is to be used. A bare, hot playground is about the most unattractive spot in the city.

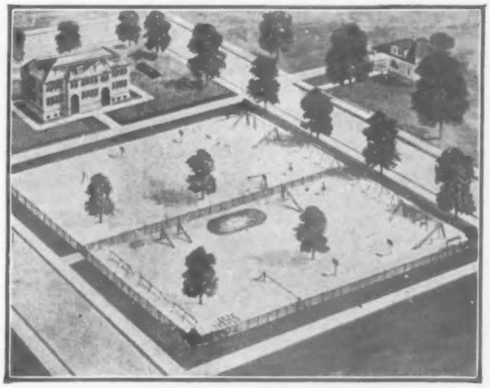
We show here by way of illustration a suggestion for a neighborhood playground embodying some of the special desirable features mentioned.

Observe the low fence around swing frames. This will serve greatly to prevent accidents to children from running heedlessly into the flying swings.

We shall be pleased to correspond with you in regard to any recreation plans or developments.

Typical plans in blue-print form of athletic fields, baseball diamonds, football, soccer, basket-ball, tennis courts, or special layout plans of equipment for your playgrounds or gymnasium, will be sent on request.

Catalogs sent on request.



SUGGESTION FOR A NEIGHBORHOOD PLAYGROUND ADJOINING PUBLIC SCHOOL

EVERSON FILTER COMPANY

641 North Green Street, Chicago, Ill., U. S. A.

The Latest Everson Development for Safety Swimming Pools

Here is the authoritative, unbiased report on the sensational, new, Jewell Electric Sterilizer.

Following an exhaustive scientific examination of the new Jewell Electric Sterilizer, both under laboratory and actual pool conditions, the Columbus Laboratories of Chicago, nationally known chemical and biological laboratory established in 1893, rendered the following report, which appears in its entirety.

CHICAGO
May 8, 1931

Everson Filter Co.
647 N. Green Street
Chicago, Illinois
Gentlemen:

"We are submitting herewith a report on observations made of the construction and operation of the Jewell Electric Sterilizer.

"From a careful examination of the mechanical details of this machine, we find it to be of a very simple design and of sturdy construction with provision for installation in sizes to meet any demand.

"We note that it requires either a standard motor-generator set or a rectifier. All parts of the Sodium Hypochlorite Generator are built of materials which should last indefinitely. We are favorably impressed with the accessibility of all parts in case of adjustment or replacement. Certain hose connections and the filter portion of the electrolytic cell, itself, will have to be replaced after a reasonable length of time. These parts can be purchased at a trivial price. The electric connections to the sterilizer can be made from any ordinary lighting circuit.

"We have run a test operation on this machine:

(1) To determine whether or not it actually produces sufficient Sodium Hypochlorite to serve the purpose for which it is intended.

(2) To determine whether or not it is constant in its operation.

(3) To determine whether or not it is economical in operation.

"These tests were run on a sterilizer which had been standing idle over night, being operated and tested in the usual practice; 8 amperes, 16 volts current was supplied by motor-generator set operating on regular 110 volts, 60 cycles, A. C. current from the lighting circuit.

"Samples for analysis of solution were taken periodically over five-hour periods during which time one gallon of brine solution was consumed. This brine solution contained 26% sodium chloride (salt), which represents 2.6 pounds of ordinary rock salt.

"(a) On the basis of our test, the following results would be obtained in a twenty-four hour operation:

Gallons of Sodium Hypochlorite solution in 24 hours	166.0 gallons
Average available chlorine contained in solution produced	0.164%
Equivalent to pounds chlorine in 24 hours	2.27 pounds
Sodium Hypochlorite in 24 hours...	4.76 "
Salt required for 24 hours' run	12½ "
Reaction of solution produced	Neutral

"The above analysis represents the normal operation of the Jewell Electric Sterilizer and shows the production of available chlorine over period of 24 hours is about 12% more than the normal rated capacity of the apparatus.

"The above test shows that the Jewell Electric Sterilizer produces a neutral Sodium Hypochlorite solution free from acidity.

"Sterilizing solutions for swimming pools should be free from acidity.

"In addition to the above test on the machine, we have examined swimming pools treated by Sodium Hypochlorite Solutions produced by this type of machine, and find the water to be entirely safe from a bacteriological standpoint and to contain residual available chlorine in excess of that ordinarily carried without noticeable odor or irritating effect. Lack of odor and irritation in swimming pool water sterilized with neutral Sodium Hypochlorite is one reason why such type of treatment is to be preferred over direct chlorine gas treatment of the water.

"We conclude from our analysis as above that you have produced a very practical, economical and satisfactory means of sterilizing water in swimming pools which will meet the most exacting requirements for this purpose."

Respectfully submitted.
THE COLUMBUS LABORATORIES
(Signed) *G. L. Teller*

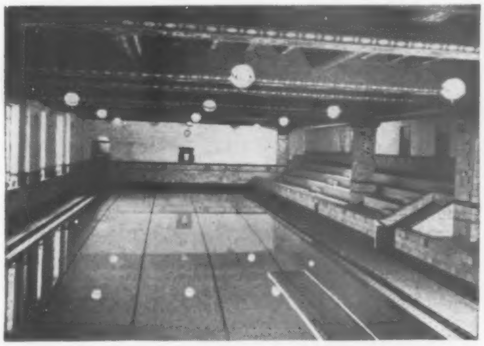
EVERSON SAFETY SWIMMING POOLS

EVERSON
Safety
SWIMMING POOLS

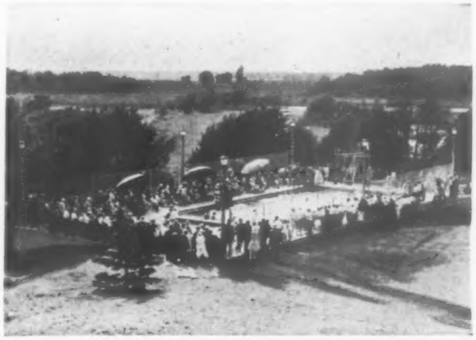
EVERSON Swimming Pools are safety pools that more than fulfill the most rigid Federal, State and Municipal health requirements. They embody a practical excellence resulting from over 28 years of specialization and unchallenged leadership in this field. During this time, EVERSON has pioneered the way, has led in research, development and construction. Starting with the Everson Re-Circulating System of continuous water purification, Everson products and activities in this field have grown till this company now supplies either complete swimming pools or any part thereof.

Estimates, Sketches, FREE

To members of Boards of Education, Civic Committees, Faculty Members, and to licensed engineers and architects, the Everson Filter Company offers, without charge, preliminary engineering service, advice, counsel, sketches and estimates for any proposed pool, or for the remodeling of any existing pool. Use this valuable service. It obligates you in no way. (See paragraph on Free Bulletins below.)

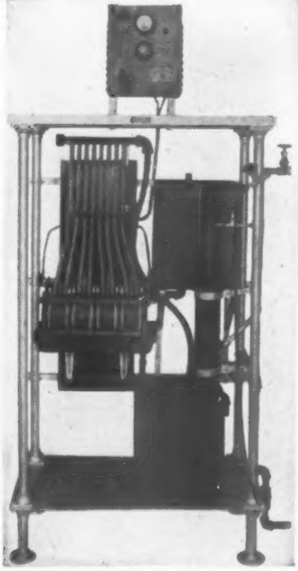


A TYPICAL EVERSON SAFETY POOL



AN OUTDOOR EVERSON SAFETY POOL

NEW EVERSON DEVELOPMENTS!



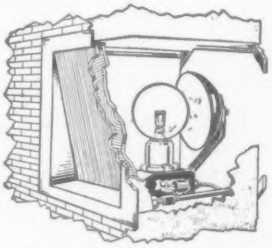
Jewell Electric Sterilizer

Keeps Pool Water Pure, Germ-Free, Safe.

This remarkable new unit, developed in the EVERSON laboratories, makes Sodium Hypochlorite for sterilization from ordinary rock salt and water, and *feeds it into the pool water in a safe non-irritating form.* Operating cost seldom exceeds ten cents per day. Circular on request.

Everson Underwater Lights

Beautify, Aid Instruction



Developed by Everson, these lights stop all glare, evenly illuminate every corner of the pool. Each detail of form and movement of swimmers is easily seen and many modern, staging effects are made possible.

Other Everson Equipment

- Filters
- Sterilizers
- Pumps and Motors
- Heaters
- Vacuum Cleaners
- Hair and Lint Catchers
- Built-in and Portable Suction Pool Cleaners
- Corametal (non-tarnishing) Pool Fittings

Write for Free Bulletins

Informative bulletins covering all phases of pool design, construction and maintenance will be sent free, upon request. Write to Everson Filter Co., 641 N. Green Street, Chicago, U. S. A.

EVERSON SAFETY SWIMMING POOLS

GENERAL UTILITIES MFG. CO.

4058 Beaufait St., Detroit, Mich.

"The Electric Towel"

MODERN — SILENT — SANITARY

Modern schools, playgrounds and swimming pools have adopted the "Electric Towel" as the new, sanitary method of drying the hands and face.

The improved "Electric Towel," a development of ten years by the originators of electric hand drying, is now offered in new and attractive models for the consideration of school principals and superintendents, playground commissioners and architects who desire the last word in safe, sanitary and efficient washroom equipment.

BUILT-IN WALL TYPE

Cut Cost 60% to 80%

The economy of the "Electric Towel" as compared with cloth or paper towels, and the atmosphere of cleanliness and good order that it imparts to the wash room are factors which make it a popular addition to the school and playground wash room.

Actual savings effected by the use of the "Electric Towel" are from sixty to eighty per cent. With this machine janitor service in the wash room may be dispensed with because there are no unsightly litters of discarded cloth or paper towels to be gathered up or swept out.

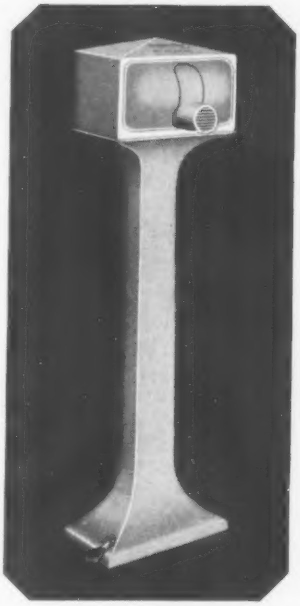
Investigation of the comparative costs of drying service shows that one thousand "dries" with the "Electric Towel" cost 30¢, as compared with $5.00 for cloth towels and $3.35 for paper.

The General Utilities Mfg. Co. will be glad to assist your community in planning the most effective use of "The Electric Towel" for your school, playground or swimming-pool wash room.

WASH ROOM EQUIPPED WITH RECESSED WALL TYPE

Standard Pedestal Type

This model of the "Electric Towel" is the one most generally used in schools, playgrounds and bathhouses where the character of construction does not lend itself easily to the "recessed wall type." It is made of pressed steel and is finished in pure white porcelain enamel, giving it a handsome, clean appearance that harmonizes well with the other sanitary fixtures of a well-ordered lavatory or wash room. The adjustable nozzle may be moved up or down as required in order to deliver its stream of clean, electrically heated air either to the hands or face. The operation is controlled by a foot pedal, placed so as to provide maximum of ease to the user.



STANDARD PEDESTAL TYPE

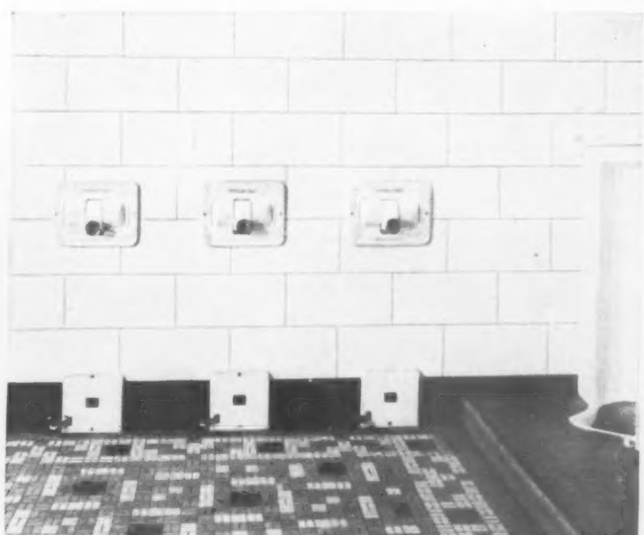
The Gymnasium Hair Dryer Model

This style of Electric Towel should be installed in all schools where swimming is taught in connection with gymnasium work. Every school must as a matter of duty take precautions against epidemics of colds which can start quickly when the pupils attend class rooms after swimming and get their hair wet. This Model Electric Towel is a very necessary installation in modern school gymnasiums.

The Recessed Wall Type

The built-in model "Electric Towel," also with adjustable nozzle and foot-pedal control, is now specified by leading architects throughout the country on up-to-date gymnasium, playground and swimming-pool wash rooms. The constant improvement of the "Electric Towel" G. E. motor over a period of ten years makes it absolutely free from vibration, so that it is now practical to install it in the wall. Contrast the appearance of a wash room equipped with unsightly cabinets for paper towels or racks for cloth towels with one equipped with the "Electric Towel" recessed in the wall and harmonizing perfectly with the snow white wall and other fixtures.

THE GYMNASIUM HAIR DRYER MODEL



MODERN LAVATORY "ELECTRIC TOWEL" EQUIPPED

GIANT MANUFACTURING CO.

Trenton, N. J. Council Bluffs, Iowa Oakland, Calif.

Manufacturers of

PLAYGROUND APPARATUS

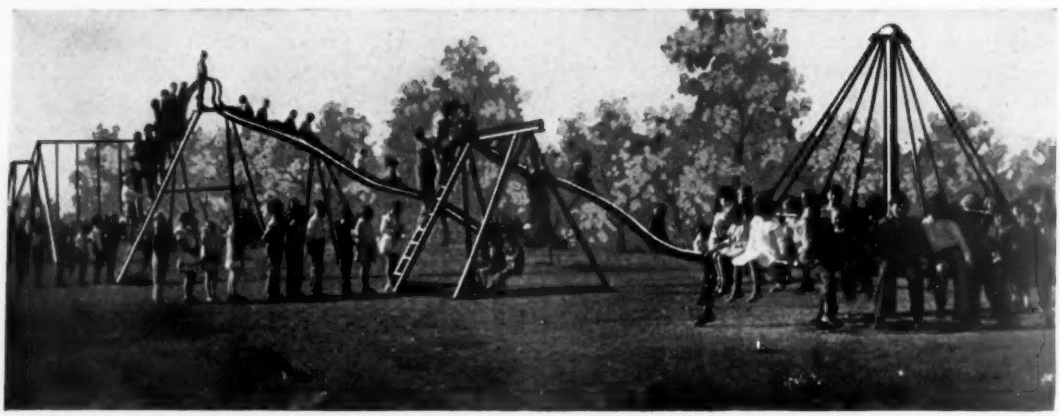
FLOODLIGHT PROJECTORS

PORTABLE BLEACHERS

CHAIN-LINK PROTECTION FENCE

SWIMMING POOL EQUIPMENT

The whole world knows this mark is an emblem of highest quality and service

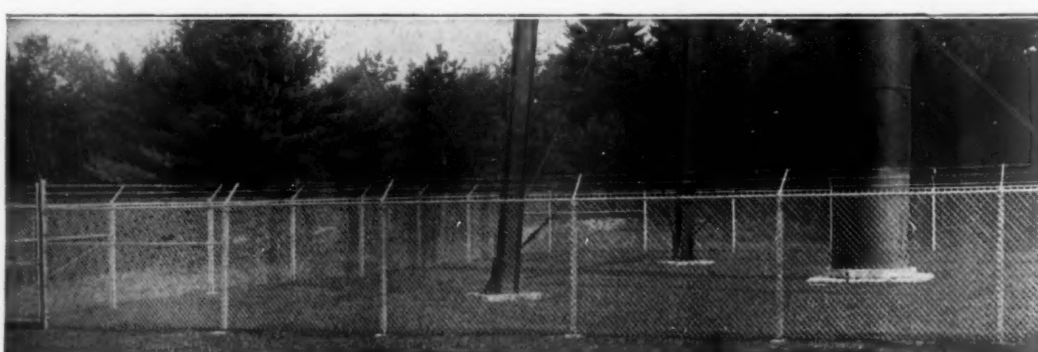


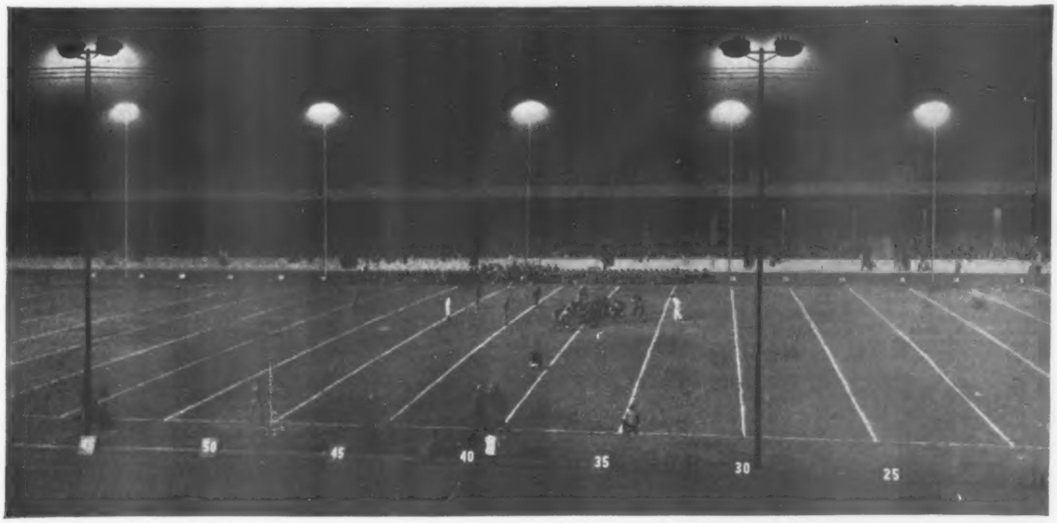
Playground Apparatus

Complete line of playground equipment combining safety, fun and health-building features essential for the enjoyment of young children. Sturdily constructed of finest quality materials, Giant Apparatus leads the field.

Giant Protection Fence

Provides protection for school yard, playground, athletic field, tennis court, etc. Strongly constructed and made in various styles to fit every fencing requirement. Will give lifetime service.





Giant Floodlight Projectors

Proved best for all night athletics. Give a soft, glare-free light, evenly distributed and free from shadows. Giant Projectors more nearly approach the efficiency of daylight than other equipment. They are standard for all types of outdoor lighting.

Giant Portable Bleachers

Strong, safe and comfortable; easily and quickly erected. Made of highest quality materials and will last indefinitely.

All Outdoor Recreation

We manufacture complete equipment for Swimming Pools, Athletic Fields, Tennis Courts and Playgrounds for day and night play. Write for illustrated catalog. Address nearest office.

life is just starting when cheaper substitutes are almost worn out. A study of the accompanying illustration tells the story. Here, truly, is an item that merits the keenest judgment in purchasing. Hundreds of Narragansett Mats have been in use for more than twenty years in scores of the best-known institutions.

Gymnasium Catalog F

This catalog should be in the files of every purchaser of Gymnasium Apparatus.

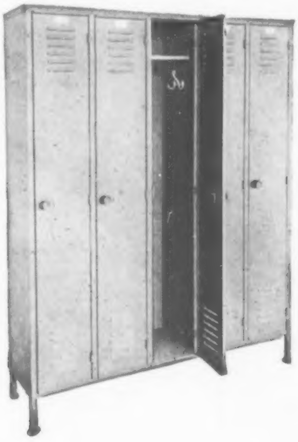
The catalog numbers are used in specifications to identify the type of apparatus required.

A Manual of Gymnasium Construction is available in monograph form to Physical Directors, Building Committees and Architects.

Here can be found detailed information regarding the building of a gymnasium and special attention has been given to the problem of preparation of walls and ceilings for the attaching of apparatus.

Anthropometric Apparatus

Vital-measurement apparatus required by physicians and physical directors for the ascertaining of physical capacities of individuals forms an important part of our stock. A large supply is available for prompt shipments.



Steel Lockers

Narragansett pioneered in the manufacture of steel lockers and shelving. Today, these products by Narragansett are outstanding for service, attractiveness and durability. For offices, stock rooms, sewing rooms, laundries, checkrooms, etc. Lockers, Cabinets and Shelving are furnished in a wide choice of sizes.

Steel Storage Cabinets

Utility, beauty and economy—these are characteristic of Narragansett Cabinets. Narragansett Cabinets are built to last. Furnished in a variety of sizes and for every use to which a steel cabinet can be adapted. Attractive factory prices will be found in our Cabinet folder.

Adjustable Steel Shelving

The wide, general acceptance of steel shelving because of its long life, economy, adaptability and sanitation finds Narragansett ready to furnish a type of steel shelving that displays the highest type of ingenuity in design and durability in manufacture. Narragansett Steel Shelving is distinctly superior. Quickly assembled or disassembled. Heavily enameled. Estimates and suggestions will be gladly furnished and a Shelving Folder is ready for mailing upon request. Send for it. You will find a wide selection of types and sizes.

WALLACE & TIERNAN COMPANY, INC.

Manufacturers of Chlorine and Ammonia Control Apparatus

Main Office and Factory: Newark, New Jersey

"THE ONLY SAFE WATER IS A STERILIZED WATER"

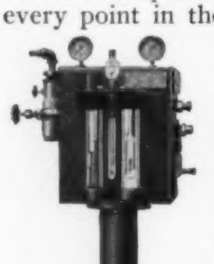
BALTIMORE, BOSTON, BRIDGEPORT, BUFFALO, CHARLESTON, CHARLOTTE, CHATTANOOGA, CHICAGO, CLEVELAND, COLUMBUS, DALLAS, DENVER, DETROIT, FORT WORTH, HOUSTON, INDIANAPOLIS, JACKSONVILLE, KANSAS CITY, KNOXVILLE, LEXINGTON, LOS ANGELES, MILWAUKEE, MINNEAPOLIS, MONROE, LA., NEW YORK, OGDEN, OKLAHOMA CITY, OMAHA, PHILADELPHIA, PITTSBURGH, ROANOKE, SAN DIEGO, SAN FRANCISCO, SEATTLE, ST. LOUIS, SYRACUSE, WICHITA, KAN.

WALLACE & TIERNAN, LTD., TORONTO, CANADA
WALLACE & TIERNAN, LTD., LONDON, ENGLAND
WALLACE & TIERNAN, LTD., WINNIPEG, CANADA
WALLACE & TIERNAN, LTD., MONTREAL, CANADA

With the school swimming pool firmly established as a part of the physical training program, efficient sterilization is necessarily important. School executives can do no better than to follow advice given in the Report of the Joint Committee of the American Public Health Association and the Conference of State Sanitary Engineers. This report, in part, states: "From all available information, the addition of chlorine either as a gas or water solution by use of proper apparatus is today the most satisfactory method of pool disinfection." Chlorine alone gives the residual penetrating action for the complete protection of bathers at every point in the pool. More than 3000 swimming pools of the United States today rely on W&T chlorinators for positive disinfection.

"SWIM IN DRINKING WATER"

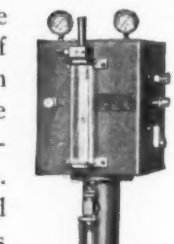
W&T Type MSP Chlorinator—For the majority of medium-sized pools, this type machine is most suitable. It not only accurately controls the small amounts of chlorine but gives a feed range sufficiently wide to include all changes in bathing loads. All control parts are on the outside and a removable hood makes complete inspection possible at any time. Its simple construction and operation are readily understood by the practical pool attendant.



W&T TYPE MSP CHLORINATOR FOR THE STERILIZATION OF AVERAGE SIZED SWIMMING POOLS

W&T Type MSV Chlorinator is the efficient sterilizer for large pools, having heavy bathing loads. Simplified design and sturdy construction have combined to make unusual performance records for this type of chlorinator. Of more than 3000 installed since the first went into service eight years ago, not a single machine has ever worn out. A survey of repair costs indicates average annual maintenance charges do not exceed one per cent of the initial investment.

W&T Ammoniator—Used with a W&T chlorinator for the production of chloramine. Chloramine is the most advanced method of pool sterilization. High chlorine residuals can be carried without objectionable tastes or odors. Chloramine rids filters and pool water of algæ growths—a real saving in operating costs. Savings of as much as $200 a season have resulted from the use of chloramine. W&T Ammoniators are made by the same rigid production standards and excellence of material as W&T chlorinators. W&T Ammoniators differ only in the special materials required for the efficient metering of ammonia.



W&T AMMONIATOR USED WITH A W&T CHLORINATOR TO PRODUCE CHLORAMINE

A W&T CHLORINATOR STERILIZES THE PASADENA HIGH SCHOOL POOL, PASADENA, CALIF., AT A COST OF LESS THAN 50 CENTS A MILLION GALLONS

W&T Chloro Clock accurately feeds predetermined quantities of sodium hypochlorite or similar solutions. It is a simple machine which any one can understand and operate. The W&T Chloro Clock is ideal protection for the very small swimming pool.

W&T TYPE MSV CHLORINATOR FOR STERILIZATION OF LARGE POOLS

W&T Electrolytic Chlorinator — For swimming pool operators and other commercial users of chlorine who wish to manufacture their own chlorine, the W&T Electrolytic Chlorinator is efficient, correct equipment. Its operating principle and rugged construction combine many features not obtainable in other electrolytic chlorinators. Fully aware of existing electrolytic chlorinator deficiencies, W&T have designed a chlorinator that will give satisfactory service over long periods with a minimum of trouble and maintenance costs.

At Your Service—We are prepared to study any problems covering the sterilization of swimming pools and a nationwide service organization is responsible for satisfactory performance of W&T equipment.

Current literature on the sanitation of swimming pools is available on request.

W&T ELECTROLYTIC CHLORINATOR

WATT MANUFACTURING CO., INC.

Manufacturers and Erectors of Gymnasium Bleachers
Steel Stairs, Plain and Ornamental

Pittsburgh, Pa.

BLEACHERS (ELECTRICALLY OPERATED)

(Patent Applied for)

Movable bleachers for gymnasiums that may be raised to a position flat against the wall—here is the solution of a problem that is often met in the design of gymnasiums—to make possible the use of the room for several different purposes and, at the same time, conserve space.

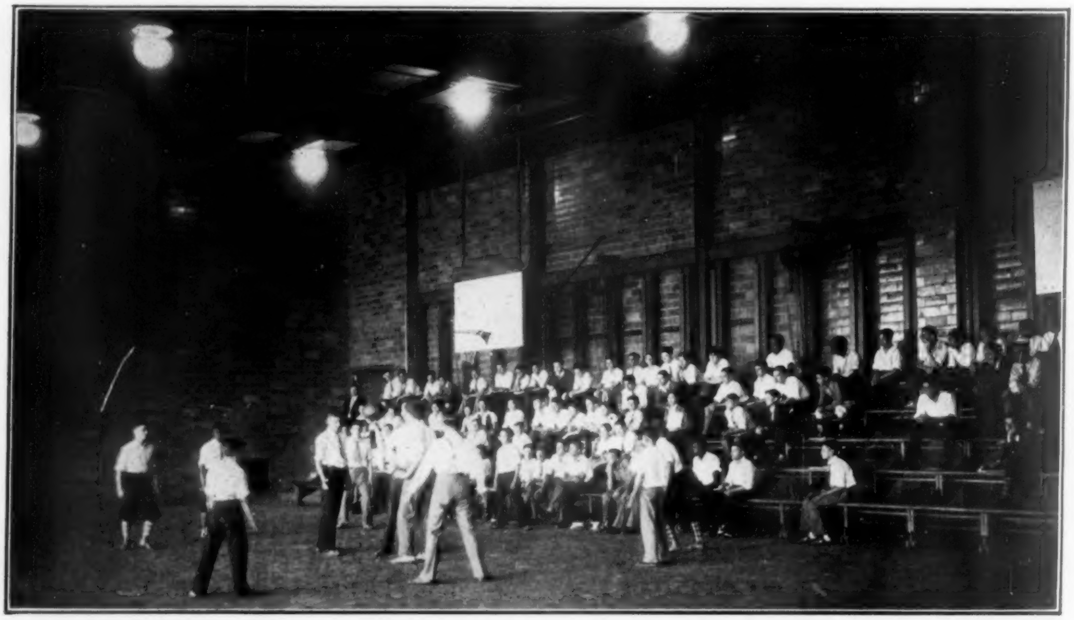
The bleachers are constructed as if for a permanent installation, but in sections; then rollers are placed under the front bearings and guides are set against the back wall. When lowered into position for use, the bleachers extend out into the gymnasium about ten to sixteen feet (with from five to nine rows of seats). When it is necessary to use the entire gymnasium space for basketball or other purposes, the bleachers are raised to a position flat against the wall so that they extend out into the room only about two feet.

These Bleachers operate from an electric light circuit—with remote push button control—three push buttons being provided; one to raise, one to lower, and the third to stop it at any desired position. However, it is unnecessary to use this "stop" button since the Bleacher is provided with an electric limit switch automatically stopping it at extreme raised or lowered positions.

We use the very finest motor and electrical equipment. The reduction gears are of steel, machine cut, and run on Timken Roller Bearings. The gears and bearings are self-enclosed, running in oil. The entire lifting apparatus, together with motors and switches, are enclosed in a readily removable metal box, which prevents it being tampered with.

You will notice that the Bleacher is not supported from the ceiling; all the load is carried directly on the floor. Another point—when the Bleacher is in the lowered position, the load is carried directly by the pipe guides which relieve the lifting mechanism of any strain.

The bleachers are sturdily constructed, not only to provide adequate support for the weight of the occupants but to allow an ample factor of safety for the sudden changes in loading and the vibration incident to various conditions. The steel supports of plates and angles carry the heavy wood seats and foot rests. The rollers at the front end are roller bearing, thus making for easy handling of the sections. They are of a fiber composition which will not mar the floor. The guides are attached to the wall and so constructed that, when bleachers are lowered, their weight is carried on them and not on the hoists.



GYMNASIUM BLEACHERS, BAXTER SCHOOL, PITTSBURGH, PA.—ELECTRICALLY OPERATED BY REMOTE PUSH BUTTON CONTROL

Service—Our modern plant is fully equipped to execute any size order, and our Engineering and Estimating Department is at the service of any school architect at any time. Typical bleacher details, estimates and suggestions will be submitted on request. We are equipped to erect our bleachers anywhere in the United States.

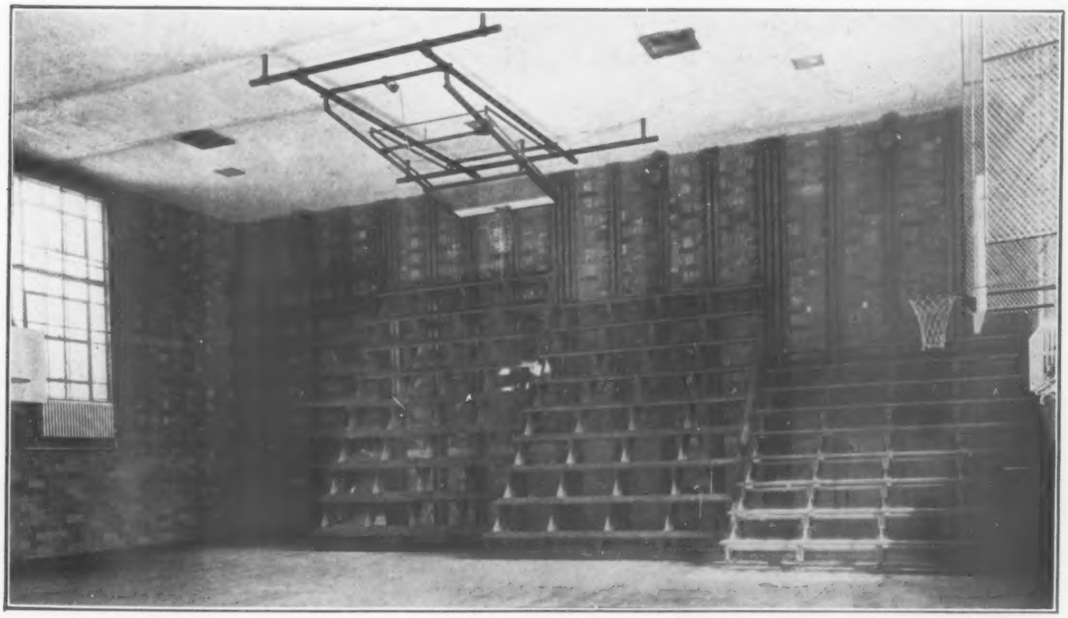
STAIRS—STEEL AND CAST IRON

In addition to gymnasium bleachers, the Watt Manufacturing Company, Inc., has long manufactured stairs of every type and construction. We aim to maintain the highest standard and quality of workmanship at a reasonable cost. Our stairs meet the requirements of all State and city building codes.

Our standard stairs are attractive in appearance and can be readily modified to meet special requirements. They can be ornamented by applying plain or ornamental mouldings on strings and facias, cast iron caps and drops on newel posts, scrolls and leaf motifs on railings, etc.

Service—Our estimating and draughting department will be glad to assist any school architect in the designing and construction of stairs. Typical stair details, estimates and suggestions will be submitted on request. We maintain a modern plant fully equipped to execute any size order, and are equipped to erect our products anywhere in the United States.

TYPICAL INSTALLATION OF WATT STEEL STAIRS



BLEACHER SECTIONS PARTLY AND COMPLETELY RAISED AGAINST THE WALL—CLIFFORD B. CONNELLEY TRADE SCHOOL, PITTSBURGH, PA.

WILLIAMS IRON WORKS, INC.

430 East 102nd Street, New York, N. Y.

Manufacturers of

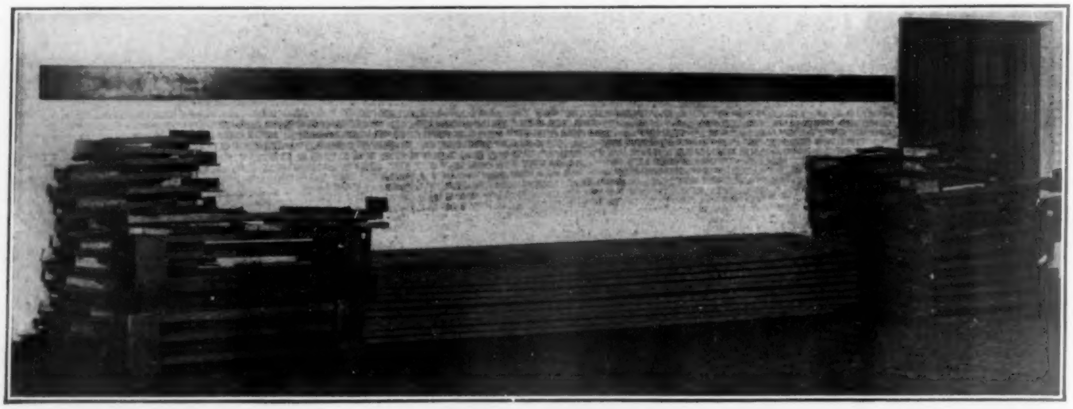
WILLIAMS PORTABLE STADIUM

AT ROOSEVELT HIGH SCHOOL IN YONKERS, NEW YORK

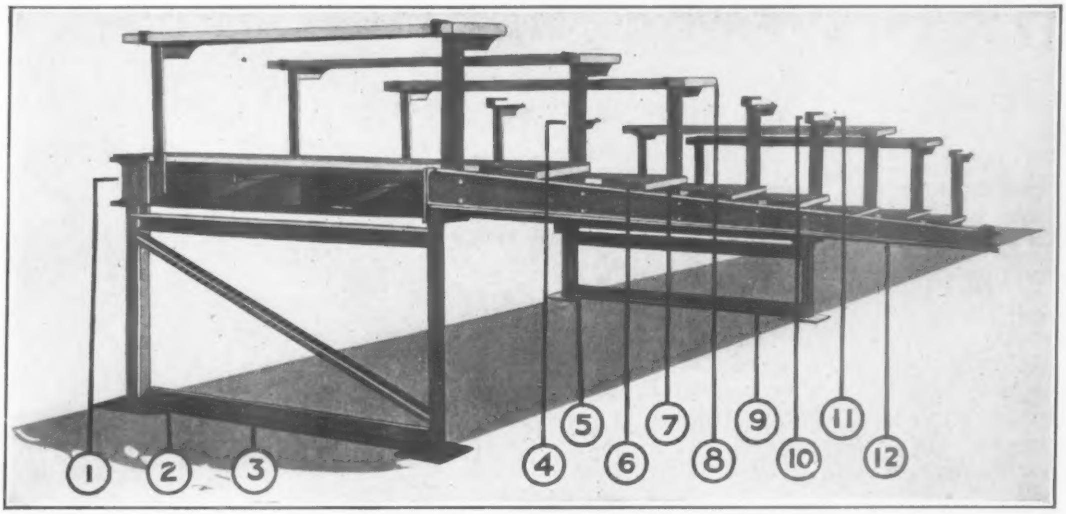
The Williams Portable Stadium is standard equipment at schools, colleges and playgrounds for indoor and outdoor use. The structural steel supports and Oregon fir seats and footboards are built of light units that can be assembled by unskilled labor.

The seats and footboards are wide and continuous so that spectators can walk to their seats without danger of falling thru open spaces or stumbling over obstructions. Safer than all wood stands and more comfortable than all steel or concrete stands. Let us work out your problem for you.

BOLTLESS — PORTABLE — SECTIONAL



THE MATERIAL FROM THE ABOVE STADIUM KNOCKED DOWN, READY TO BE LOADED ON A 1-TON FORD TRUCK



DETAIL OF CONSTRUCTION

The photograph above will give an idea of the construction of the Williams Portable Stadium. Referring to the corresponding numbers above, the following is a description of the stadium parts:

(8) Seat board held in position on

(4) Steel seat carrier riveted to

(12) Main string of structural steel supported by

(3) and (9) Structural steel upright frames connected to main string by

(1) Patented slip joint requiring no bolts to assemble

(10) Spring welded to carrier (4) holding seat boards (8) down.

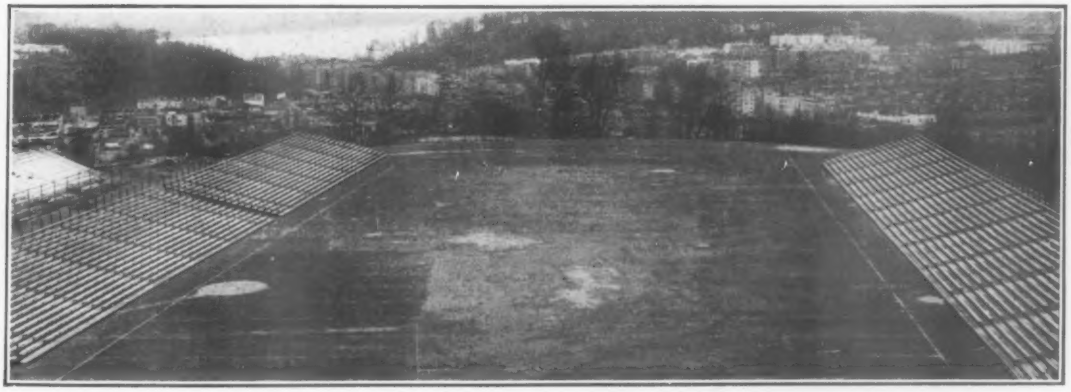
(11) Fixed steel clip welded to carrier (4) to keep seat board in position.

(7) Footboard.

(6) Filler board (may be omitted on low stadia).

(2) and (5) Steel bearing plates.

A steel shelf angle is welded to the main string (4) upon which footboards rest. Steel slip joints at the end of the wood seats and footboards come to the site fastened on the boards.



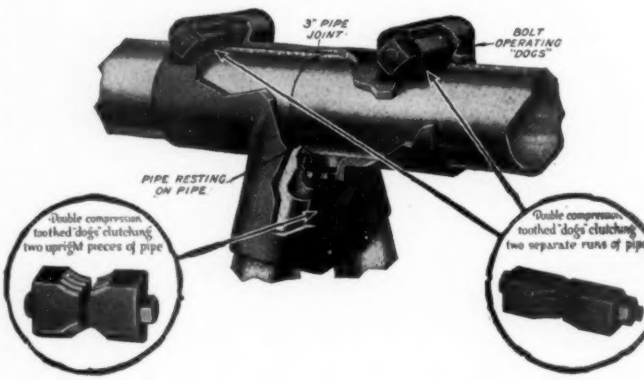
AT GEORGE WASHINGTON HIGH SCHOOL, NEW YORK, N. Y.

THE EVERWEAR MFG. CO.

BOX 108

SPRINGFIELD, OHIO

EverWear PLAYGROUND AND WATER APPARATUS



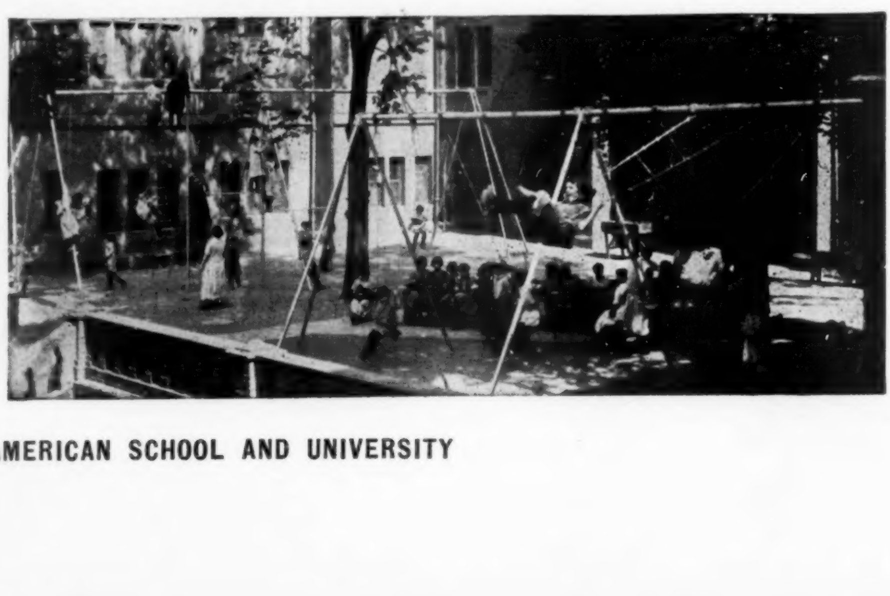
The heart of the whole subject of safety in playground apparatus is found in the details of its construction. EverWear apparatus is favorably noted for its unique construction and for the positive safety of its outfits.

Frame Fittings are the vital parts of swing and travel ring outfits, large frame slides, see-saws, teeter ladders, diving outfits and diving swings. The safety of the entire structure is dependent upon them.

EverWear, Patented, Double-Compression, toothed "dog," heavy one-piece, malleable iron, Cadmium plated frame fittings are easily the safest and most durable fitting made for playground apparatus. (Note illustration above.) The double-compression toothed "dogs" bite into the frame pipe and hang on with a breakless grip. Each pipe is gripped by not less than 10 square inches of positive gripping surface.

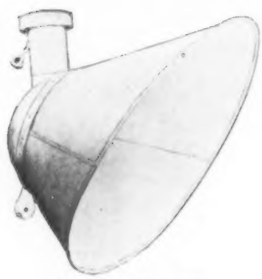
Outfits using EverWear fittings are easier to erect than with any other fittings. This fact makes it understandable why, in spite of a greater first cost, EverWear outfits finally represent a smaller investment. It should always be kept in mind that the cost of an outfit is not complete until it is installed and ready for use.

EverWear fittings are safest, easiest to erect, most simple, most positive, most rigid, strongest, cheapest in the long run. Ask for our Catalog No. 23; it shows 255 different types, sizes and units of approved recreation apparatus. It gives interestingly complete details and a world of information valuable to those planning playgrounds, beaches, pools, etc. It comes free to you—write today.



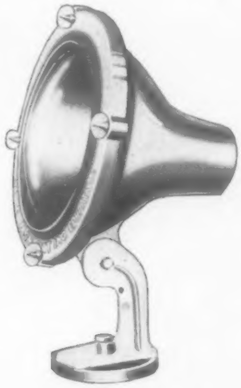
IRA E. FASNACHT, INC.

Ephrata, Penna.



TYPE NO. 100

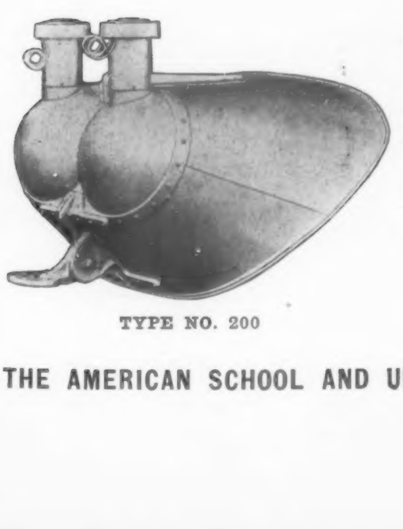
Floodlights By Fasnacht



TYPE NO. 010

will prove the best in service, ease of installation, efficiency, and first cost for your new FLOODLIGHTING INSTALLATIONS for NIGHT FOOTBALL, BASEBALL, SOCCER, TENNIS, PRACTICE FIELDS, TRACKS and POOLS.

FASNACHT FLOODLIGHTS, pioneers in the field of GLARELESS FLOODLIGHTING, have been used on such outstanding installations as: Haines Race Track, York, Pa.; Hagerstown, Md., Baseball Club; Olentangy Park, Columbus, Ohio; Playground at Souderton, Pa.; Carsonia Park, Reading, Pa.; York, Pa., Baseball Club; Playland, Rye, N. Y.; Butler University, Indianapolis, Ind.; Clay County High School, Clay Center, Kans.; Mattoon Township Park Commission, Mattoon, Ill.; Upper Darby Football Field, Philadelphia, Pa.



TYPE NO. 200

FASNACHT manufactures a complete line of open and closed type floodlights, stage and theatrical equipment. A highly trained and efficient engineering department offers layouts and recommendations without obligation.

Send in your lighting problems

TYPE NO. 030

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

SALES OFFICES IN PRINCIPAL CITIES

UNION COLLEGE HOCKEY COURT

This Light Started Sports at Night

In the fall of 1923, Tufts College played the General Electric engineers on the Lynn Athletic Field by the light from the G.E. Novalux floodlighting projectors—the first football game at night.

Since then, this light, the General Electric type L-31 floodlight, improved year by year, has been popularizing outdoor sports at night. Under it, football, soccer, baseball, tennis, golf and hockey have been played successfully. Colleges, prep schools, high schools and civic bodies have adopted it for their fields. This totally enclosed floodlight can be used throughout the year for lighting of different athletic fields, pageants, college buildings, and parking areas.

In addition to this floodlight, an open type floodlight is available and can be readily adapted in more economical installations, to mounting on wooden poles. This open floodlight is impervious to the severest weather conditions, and furnishes an excellent job of lighting.

Since the schedule of classes often prevents hockey and football practice before 5 o'clock in the afternoon, floodlights can be used practically every night.

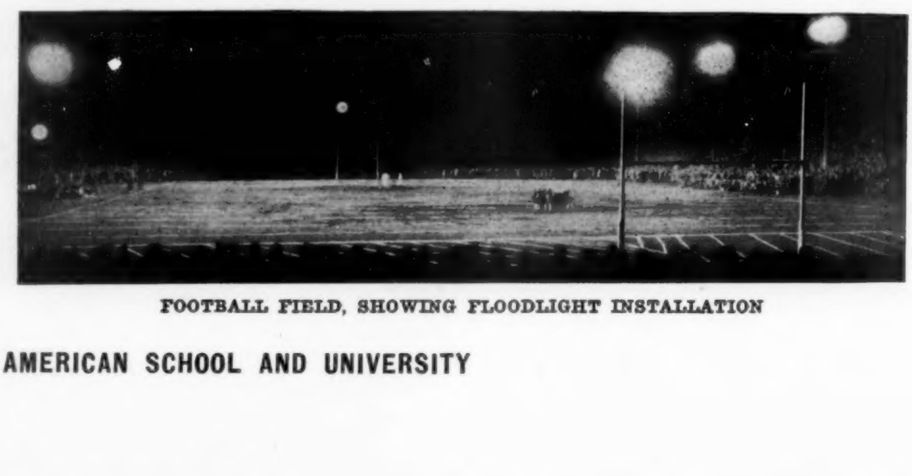
Swimming pools can be lighted at a reasonable cost with a small specially designed underwater floodlight.

Tennis courts may be illuminated adequately by the use of either the open or closed types of floodlight.

What are some of the advantages of floodlighting? Here is an example of what the athletic manager of Temple University in Philadelphia thinks of it. "Since Temple put on night football, the student attendance has jumped 33⅓ per cent. Sixty per cent of our student enrollment of 13,000 work in the afternoon, and were unable to see the afternoon contests. Night football was virtually demanded by the students."

This opinion of the athletic manager partly explains why 89 football fields were permanently lighted by General Electric in 1930. Other reasons were the big increase in gate receipts, the minimized interference with classroom duties and, of course, perfect illumination.

So when you plan to floodlight your field, pool, hockey, rink, or tennis courts, have a G.E. lighting specialist look it over. He will give you complete information and recommendations from the famous General Electric Illuminating Engineering Laboratory—gladly and without obligation. You can get in touch with him through the nearest G.E. Sales Office.



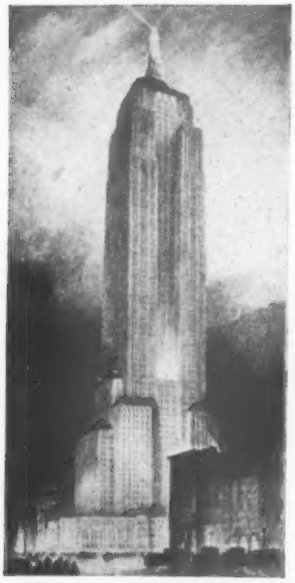
FOOTBALL FIELD, SHOWING FLOODLIGHT INSTALLATION

HYDROZONE COMPANY, INC.

Grand Central Terminal Building

NEW YORK CITY

MUNICIPAL WATER STERILIZATION OUR SPECIALTY



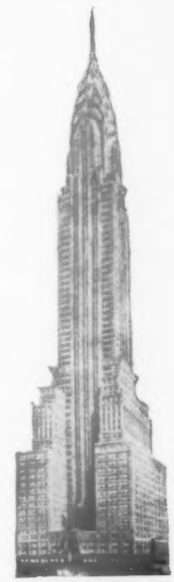
EMPIRE STATE BUILDING
Tallest and Largest Office Building in the World. New York City

THE STRAIGHT EIGHT

Reasons Why Swimming Pool Owners Prefer "The Hydrozone System"

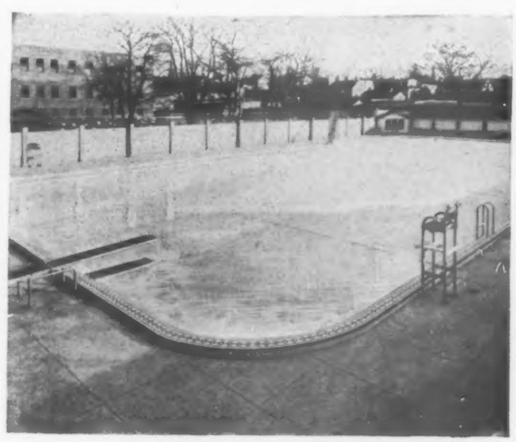
1. Perfect Sterilization Without Chemicals
2. No Irritation of the Eyes
3. No Inflamed Mucous Membrane
4. No Fading of Bathing Suits
5. No Slimy Walls and Floors from Algæ
6. No Color
7. No Taste
8. No Odor

The Hydrozone Company Gives a WRITTEN GUARANTEE of the above to the purchaser of each installation



CHRYSLER BUILDING, New York City

ESTATE OF WILLARD J. MASON
Greenwich, Conn.



FLUSHING POOL, FLUSHING, L. I.
Equipped with Hydrozone Sterilization. 600,000-Gallon Capacity

H. W. KEEBLER MANUFACTURING CO.

422 First Avenue, Pittsburgh, Pa.

Products

KEEBLER Hand-Operated and Automatic Electric Warm Air Hand, Face and Hair Dryers.

WESTINGHOUSE HIGH SCHOOL INSTALLATIONS OF DRIERS

Modern application of electricity for drying the hair, hands and face, has now been accepted and is fast proving its worth in the modernization methods now being adopted in old and new swimming pools, schools, hotels and other private or public institutions.

Advanced sanitation for the protection of public health and welfare, coupled with greater effectiveness, efficiency and reduced operating costs, placed the electric warm air dryers in a well deserved position in the public mind.

The elimination of the paper and linen towel, always expensive and in a great many cases, of a questionable sanitary standard, in public institutions, has more than anything else aroused and won public approval of the new and sanitary electric way.

Keebler Dryers

In keeping with the advancement in electric drying methods, Keebler Dryers represent the most advanced equipment to meet all requirements and installations.

Types

The Wall Model—Used mostly in the modernization of present buildings.

Built-In Wall Model—The most popular type for new buildings or pools.

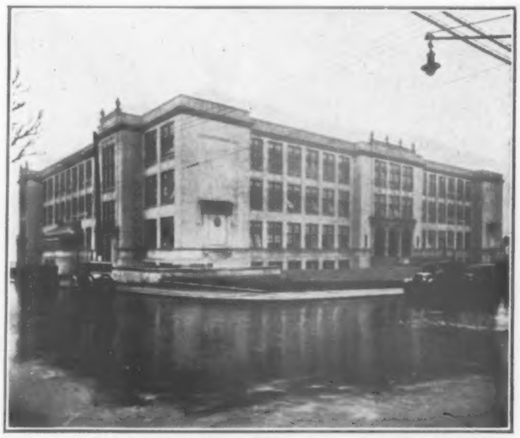
Pedestal Models—This type is available in either one, two or four outlet models, and is best adapted to present buildings or where insufficient wall space is available.

All models can be equipped with either push-button automatic time switches for face or hand drying or standard start and stop switches for hair drying.

Construction

The enclosing case, base, adjustable nozzle and pedestal are made of highest grade grey cast iron heavily porcelain enameled in any desired color.

The motor, fan, heating element and all connections are especially designed and tested for the service and are of the highest grade obtainable.



WESTINGHOUSE HIGH SCHOOL, PITTSBURGH, PA.

Ninety Keebler Dryers are installed and operating in nine Public Schools of Pittsburgh, Pa., for the student swimming pools.

Keebler Dryers and Service guarantee satisfaction.

We invite architects, engineers, school boards and building owners to bring their drying problems to us. Our experience and data, we know, will be of interest.

LEAVITT MANUFACTURING COMPANY

Urbana, Illinois

KNOCKDOWN BLEACHERS

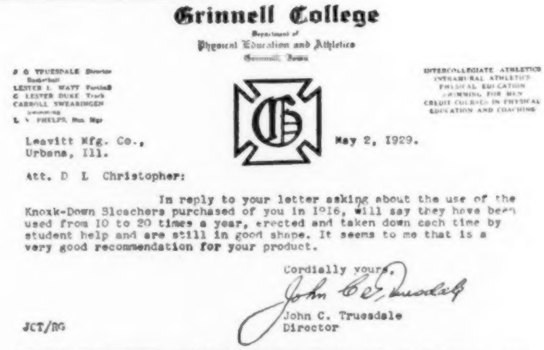
TRADE MARK REG. U S PAT OFF

"They Rise to the Occasion"

On the day of the big football game of the season, will your seating capacity be adequate? Have you movable seating that can be transferred from one location to another as need arises?

KNOCKDOWN BLEACHERS are solving both of these problems for many universities, colleges and high schools throughout the United States. These flexible, movable bleachers store in small space, can be added to your standard seating capacity on short notice, and can be moved from one position to another at any time in order to cover any particular event being held. KNOCKDOWN BLEACHERS do not offer a makeshift seat, but a comfortable, safe, solid installation, which can be charged for. We manufacture and sell sections as small as twenty seating capacity up to our largest installations, which exceed 50,000 seating capacity.

In order to estimate the amount of time to allow for setting up your bleachers before a special event: a check-up on hundreds of installations has shown an average set-up of one hundred seats to take two men twenty minutes. It takes only about half that time to take them down and store.



Grinnell College

Department of Physical Education and Athletics

Grinnell, Iowa

J. C. TRUESDALE Director Basketball
LESTER L. WATT Football
G. LESTER DUKE Track
CARROLL SWEARINGEN Swimming
L. V. PHELPS Bus. Mgr

INTERCOLLEGIATE ATHLETICS
INTRAMURAL ATHLETICS
PHYSICAL EDUCATION
SWIMMING FOR MEN
CREDIT COURSES IN PHYSICAL EDUCATION AND COACHING

May 2, 1929.

Leavitt Mfg. Co.,
Urbana, Ill.

Att. D L Christopher:

In reply to your letter asking about the use of the Knoxk-Down Bleachers purchased of you in 1916, will say they have been used from 10 to 20 times a year, erected and taken down each time by student help and are still in good shape. It seems to me that is a very good recommendation for your product.

Cordially yours,

John C. Truesdale

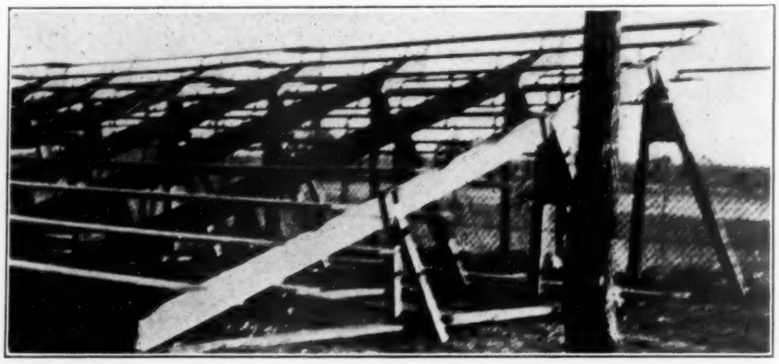
John C. Truesdale
Director

JCT/RG

THIS LETTER FROM GRINNELL IS TYPICAL OF THE EXPERIENCES OF HUNDREDS OF USERS

AN UN-RETOUCHED TESTIMONIAL

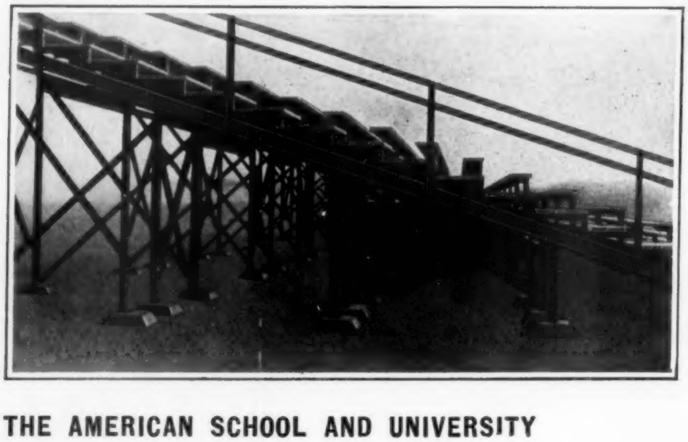
This un-retouched photograph, taken just after the football season of 1928, shows KNOCKDOWN BLEACHERS which were installed in 1916 and served the Urbana, Ill., High School through thirteen strenuous football seasons. They had no special care. After standing all through the football seasons, they were taken down, set up in the gym and used for basketball. They are in good condition today.



ADVANTAGES OF "KNOCKDOWN" BLEACHERS

1. No nails or bolts used to assemble
2. Compact to store
3. Rapidly assembled
4. Accurate assembly
5. Comfortable seating
6. Footboards and select lumber insure clean seating
7. Correct angle of elevation for observation
8. Safe seating

Write for our illustrated booklet on "Seating Problems."



Add-A-Seat STADIUM

"Permanent — Yet Movable"

There is a growing demand in schools and colleges for permanent seats which can still be moved without loss of investment if need arises, and can be easily added to. ADD-A-SEAT fits these needs to perfection. The photograph at the left shows part of the ADD-A-SEAT stadium installed. This end view gives a good idea of the heavy, rigid cross-bracing used.

THE MATHIESON ALKALI WORKS (INC.)

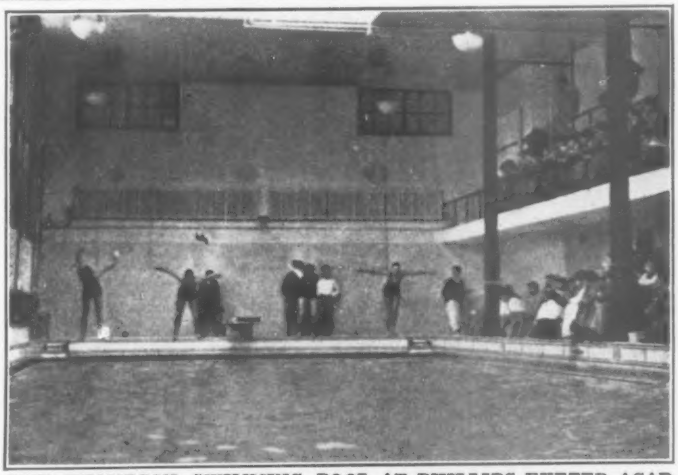
250 Park Avenue, New York, N. Y.

PLANTS
Niagara Falls, N. Y., and Saltville, Va.

BRANCH OFFICES
Widener Bldg., Philadelphia, Pa.
Straus Bldg., Chicago, Ill.
Hospital Trust Bldg., Providence, R. I.
First National Bank Bldg., Charlotte, N. C.
Dixie Terminal Bldg., Cincinnati, Ohio

Products

H T H (Hypochlorite)
Liquid Chlorine
Anhydrous Ammonia
Aqua Ammonia, 26°
PURITE (Fused Soda Ash)



THE THOMPSON SWIMMING POOL AT PHILLIPS EXETER ACADEMY IS KEPT SAFE WITH H T H. "HAVE HAD NO TROUBLE IN KEEPING THE BACTERIAL COUNT DOWN," WRITES H. A. ROSS, DIRECTOR OF ATHLETICS

Mathieson Liquid Chlorine

Mathieson Chlorine for sanitary service is supplied in special aluminum-painted cylinders in two sizes—105 pounds net and 150 pounds net—and has long been considered the standard for use in safeguarding municipal water supplies. It is used in the sterilization of many well-known swimming pools throughout the country.

Mathieson Ammonia

Pools using the ammonia-chlorine process find it a great convenience to purchase from Mathieson and get both materials from the same reliable source of supply, with warehouse stocks available throughout the country. For the largest pools it is Mathieson Liquid Chlorine and Anhydrous Ammonia; for any but the largest it may be Mathieson H T H and Aqua Ammonia. Mathieson Anhydrous Ammonia is supplied in 50, 100 and 150-pound cylinders; Aqua Ammonia, 26°, in 110-gallon drums.

Purite (Fused Soda Ash)

Purite makes it easy to control the alkalinity of swimming pool water, maintaining it constantly within the proper pH range so essential to the comfort and enjoyment of bathers. PURITE comes in handy 2-pound cakes which dissolve very slowly and prevent wide variations in alkalinity. It is packed in 200-pound bags and 350-pound barrels.

H T H (Hypochlorite)

Mathieson H T H provides a handy, reliable and economical source of chlorine for the maintenance of sanitation in any size or type of pool. H T H is a true hypochlorite of calcium containing 65 per cent of available chlorine and is very stable even under extreme summer weather conditions. A free-flowing powder, readily soluble in cold water, H T H can be added direct to the pool water if desired or fed into the water in solution form. H T H comes in 4-pound cans packed 12 to the case, each can containing 2½ pounds of available chlorine; H T H-Technical is shipped in 110-pound drums.

H T H Used in Many Ways

Here are some of the many ways H T H is being used effectively by pools of every kind:

Regular chlorination of small and medium-sized pools—indoor and outdoor—municipal, commercial, private.

Emergency reserve supply of chlorine for pools of any size or type using liquid chlorine for regular treatment.

Formation of stable chloramines in pool water in conjunction with aqua ammonia or other source of ammonia. H T H and ammonia added separately to water by means of inexpensive feeding equipment.

Periodic heavy dosage of chlorine for destruction of algæ and other plant growths in pool water or in filters.

Cleaning off of plant growths from sides, bottom and concreted surroundings—pools of all sizes.

Prevention of "athlete's foot" and other foot infections. Sprinkle dry H T H daily on floors of shower rooms so that it will be tracked about on feet of bathers; spray H T H solution on floors of toilets, dressing-rooms, runways; scrub diving-boards, ladders, etc., with H T H.

Disinfecting and deodorizing toilets, urinals, etc.

Deodorizing shower-rooms, bath-houses, etc.

Bleaching and sterilizing towels during laundering process.

Sterilizing rinse for bathing-suits.

General sanitation of every description.

Every pool, large or small, can be made safer, more sanitary, with H T H. Send for quotations and copy of useful booklet "Swimming Pool Sanitation."

PITTSBURGH-DES MOINES STEEL COMPANY

53 Neville Island
Pittsburgh, Pa.

270 Broadway
New York City

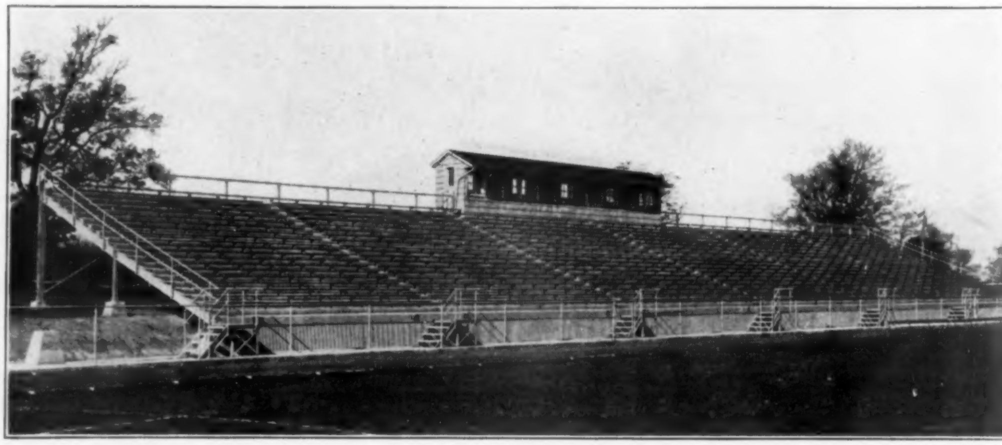
955 Tuttle St.
Des Moines, Ia.

3169 L. C. Smith Bldg.
Seattle, Wash.

1263 First National Bank Bldg.
Chicago, Ill.

367 Rialto Bldg.
San Francisco, Calif.

Builders and Fabricators of the
Pittsburgh-Des Moines
ALL-STEEL GRANDSTAND



Description

The Pittsburgh-Des Moines all-steel grandstand is a structure incomparable in safety, appearance, and low initial and maintenance costs. Its advantages are unlimited.

It is impossible for the stand to collapse, burn or deteriorate rapidly by action of frost. Then, too, as an investment the value is always present. The simplicity of its construction makes dismantling and reerection at any location an easy and inexpensive proposition.

Construction

The design and construction of the Pittsburgh-Des Moines all-steel grandstand requires a type of work in which we have had over thirty years' experience.

Trained engineers and erection crews guarantee first class jobs and complete satisfaction to any purchaser of the Pittsburgh-Des Moines grandstand.

Two shops, one in Pittsburgh, Pa., and another in Des Moines, Iowa, are equipped with all the facilities necessary to turn out first class work. Competent and experienced hands carry any grandstand job from start to finish.

The necessary material to build Pittsburgh-Des Moines grandstands is carried in stock and quick fabrication and erection are possible when time is important.

Features

1. Maximum seating capacity for any available area at a minimum cost.
2. Assured safety through its all-steel construction.
3. Low upkeep; an occasional coat of paint is all that is required.
4. A high investment value.
5. The stand is built in standard sections which can be added to or double-decked at any time.
6. Ample leg and foot room.
7. Comfortable wood seats raised on supports.
8. Clear space beneath the stand for rooms and dressing quarters.
9. Closed or water-tight construction of the stand.
10. When time is important the steel stand can be furnished quickly.

Deferred Payment

A plan for deferred payment enables any college or institution to enjoy the innumerable advantages of the Pittsburgh-Des Moines all-steel grandstand. Through this payment plan the stand is capable of earning its own cost.

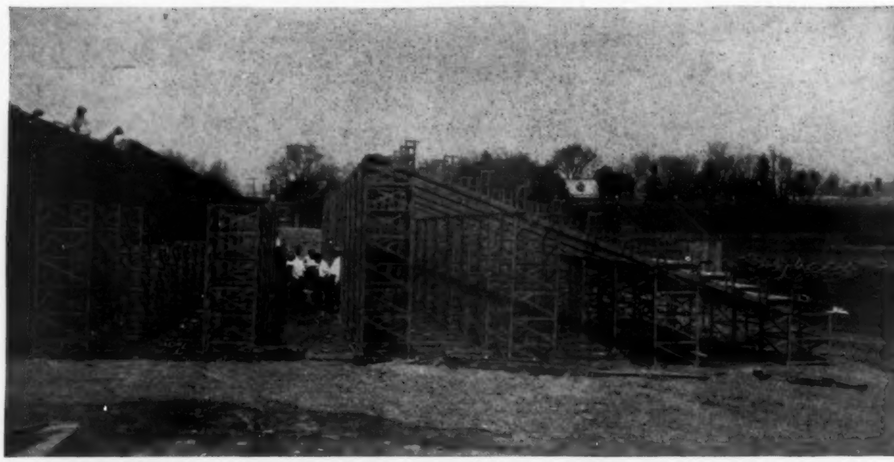
WAYNE IRON WORKS

Wayne, Pa.

Wayne Steel Grandstands

Portable, Sectional, and Permanent Types

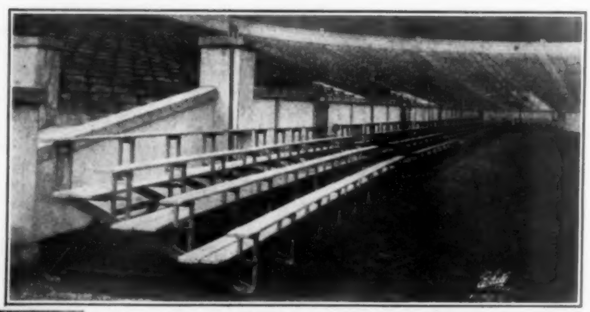
SATISFACTORILY MEET EVERY SEATING REQUIREMENT



ERECTING WAYNE "B" TYPE, SECTIONAL STEEL GRANDSTAND IN VARSITY FIELD, PRINCETON UNIVERSITY

Foremost Schools and Universities have installed Wayne Steel Grandstands because they are absolutely safe, comfortable, easily erected and are representative of the most approved engineering construction.

There has never been an accident on a Wayne Stand.



IN WEST POINT STADIUM

WAYNE "C" TYPE, SECTIONAL STEEL GRANDSTAND FOR OUTDOOR OR INDOOR USE. REQUIRES LITTLE FLOOR SPACE

WAYNE "D" TYPE, FOLDING WALL GRANDSTAND FOR GYMNASIUMS. STEEL STRINGERS FOLD FLAT AGAINST WALL WHEN NOT IN USE. NEW RACK CARRIES SEATS AND FOOTBOARDS. ENTIRELY ELIMINATES STORAGE PROBLEM

Write for data on your seating requirements

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Swimming Pool Engineers and Builders
of Indoor and Outdoor Swimming Pools

230 Park Ave., New York Central Bldg., New York, N. Y.

Products and Services

Design, Construction and Equipment of Indoor and Outdoor Swimming Pools, Wading Pools and Natatoriums.

Designing the Modern Pool

The rapid growth of the popularity of swimming pools during the last few years has been accompanied by a greater demand for convenience and for sanitary equipment. New systems of filtering, sterilizing, heating and recirculating the water have been developed. The problem of sanitary maintenance has produced changes in the design of the pool itself, while at the same time more attention is being paid to the decorative treatment of the surroundings. As a result of these developments, the work of planning, specifying and building an up-to-date pool has become increasingly complex.

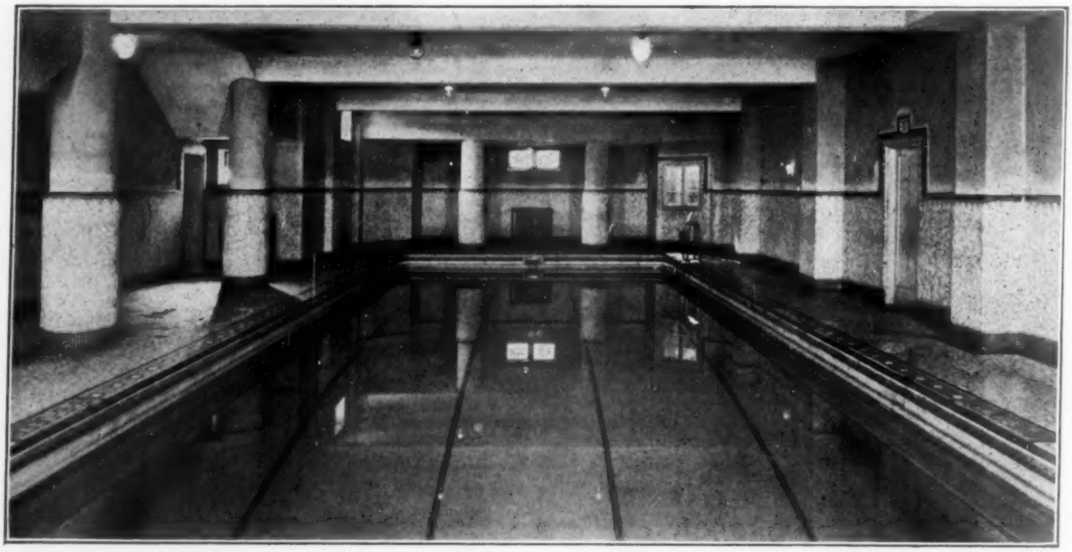
It has been found that the best solution from the architect's point of view is to consult with an experienced firm of swimming pool engineers. In this way the architect can hold down construction costs, avoid excessive demands on his own time, and insure the construction of a satisfactory, permanent swimming pool.

Our Swimming Pool Service

We are a firm of swimming pool engineers and builders. As engineers, we design indoor and outdoor swimming pools, wading pools and natatoriums. We furnish all of the necessary drawings and perform the engineering work for the reinforced concrete and waterproofing. We also lay out all plumbing and mechanical equipment and we write specifications for everything connected with the pool.

As builders, we undertake contracts for swimming pool work complete, or for any portion, such as the reinforced concrete, tile, waterproofing, mechanical equipment and accessories. If the contract is awarded to us we make no charge for our engineering work. However, if the contract is awarded to others we charge a regular engineering fee for services.

To obtain the best results the swimming pool should be treated as a unit when apportioning contracts. That is, the entire swimming pool work, including the reinforced concrete, waterproofing, tiling, mechanical equipment and accessories, should be let as a single contract. In this way responsibility for successful results rests on one organization. Preferably the swimming pool contract should be under the direct supervision of the Architect and Owner.



TROY LAUNDRY MACHINERY CO., INC.

Manufacturers of Complete Laundry Equipment for Schools, Universities and Other Educational Buildings

Factory: East Moline, Ill.

Boston: 514 Atlantic Ave. **Los Angeles:** 767 East Washington St. **San Francisco:** 954 Mission St.
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European Agents: James Armstrong and Co., Ltd., Berlin, London, Zurich

Products

Washers, extractors, drying tumblers, flatwork ironers, and a complete line of other laundry machinery and accessories. A machine for every laundry need, in sizes and types for every installation.

Troy School Advisory Service

Listed below are several factors which control the planning of the school laundry. In order to be sure of evaluating and coordinating each factor correctly, school executives are invited to consult TROY SCHOOL ADVISORY SERVICE.

Backed by Troy's fifty-two years' experience in designing complete laundry plants of every size and type, Troy Engineers are in a splendid position to co-operate with you in every laundry problem. Feel free to call on them at any time for help in solving such problems as:

1. Laundry location
2. Area of floor space
3. Floor plan
4. Dead and live loads
5. Machinery, bin and storage space
6. Power plant
7. Hot water, cold water, and steam piping
8. Hot and cold water supplies
9. Drainage and waste disposal
10. Lighting system
11. Ventilating system
12. Provision to keep dust and dirt out of laundry
13. Provision for lint disposal
14. Specifications of machinery and equipment
15. Clearances for and means of moving huge machinery
16. Material handling equipment and methods
17. Routing of work without crossing traffic lanes
18. Provision for future growth

Economies Effected by Installation of Laundry Equipment

Where the size of a school justifies the installation of laundry equipment, definite financial savings can be shown and will be realized.

These economies are four: (1) keeping down laundry costs; (2) making it possible to get quick and dependable laundry service of the quality desired; (3) allowing the school to function with a minimum supply of linen, wearing apparel, aprons, sweaters, jerseys, towels, etc.; (4) controlling the process of laundering and so insuring that the life of the goods handled will not be shortened by injurious methods.

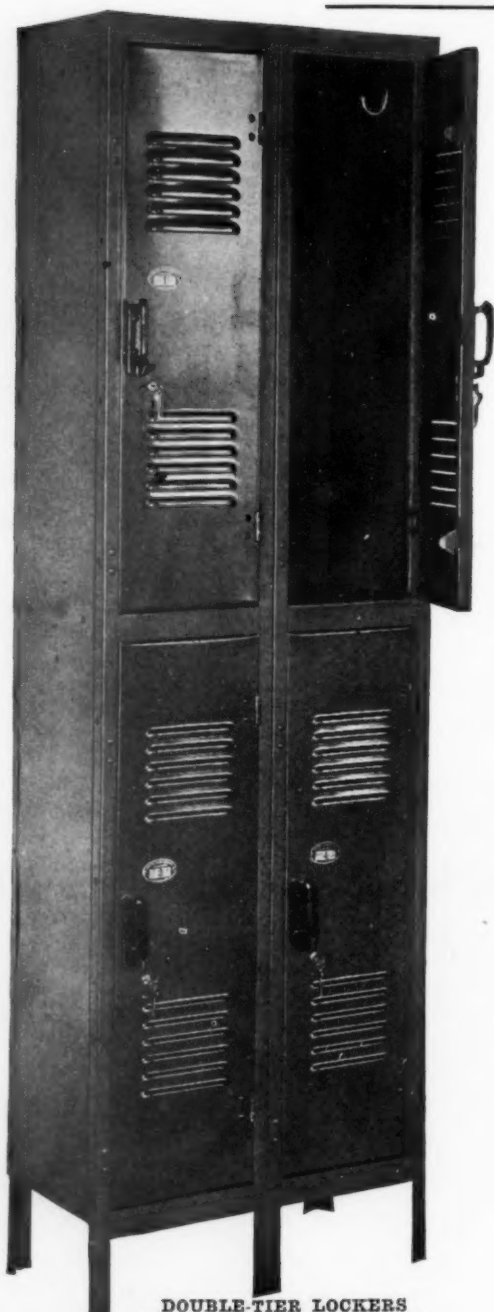
For Description of Troy Washers, Extractors, Tumblers and Ironers Suitable for School Service, See Page 412

SINCE 1879 . . . THE WORLD'S PIONEER MANUFACTURER OF LAUNDRY MACHINERY

MANUFACTURING EQUIPMENT AND ENGINEERING CO.

R. M. Leland, President

Framingham, Mass.



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Section VI

CLASSROOM — OFFICE — LIBRARY — AUDITORIUM

The Evolution of Equipment in the Elementary School

BY FRANK G. PICKELL
Superintendent of Schools,
Montclair, N. J.

ON May 1, 1876, Dr. John J. H. Love, then the District Clerk of School District No. 8 in the township of Montclair, wrote an historical report of the development of the Montclair schools. According to this report, the first schoolhouse in what is now the town of Montclair was built in 1740. The structure was one story in height, 18 by 26 feet. From my office I can see the site of that first schoolhouse, which stood about 250 feet south of the present school administration building. It had a large fireplace in one corner with an oval-shaped platform across one end for the teacher. In the center of the platform was a trapdoor through which evil-doers were dropped into the dungeon below. Flat desks or tables were arranged around the sides of the room far enough from the walls to admit of benches being placed between the desks and the walls. *All the seats were slabs with the bark side down.*

The many modifications in elementary school equipment since that early day have mostly come as the result of a changing philosophy of education. While desks had been improved as to finish and general lines, I find, according to the official minutes of the Montclair schools, that in 1873 the Board of Education was buying an old type of double primary desk. This type was used in the elementary school which I attended as a small lad in the early 90's. It was not until about 1875 that Montclair began purchasing single desks.

The most significant point, however, is that elementary school equipment did not materially change from the fixed, rigid type until comparatively recently. The first consideration which

FIGURE 1

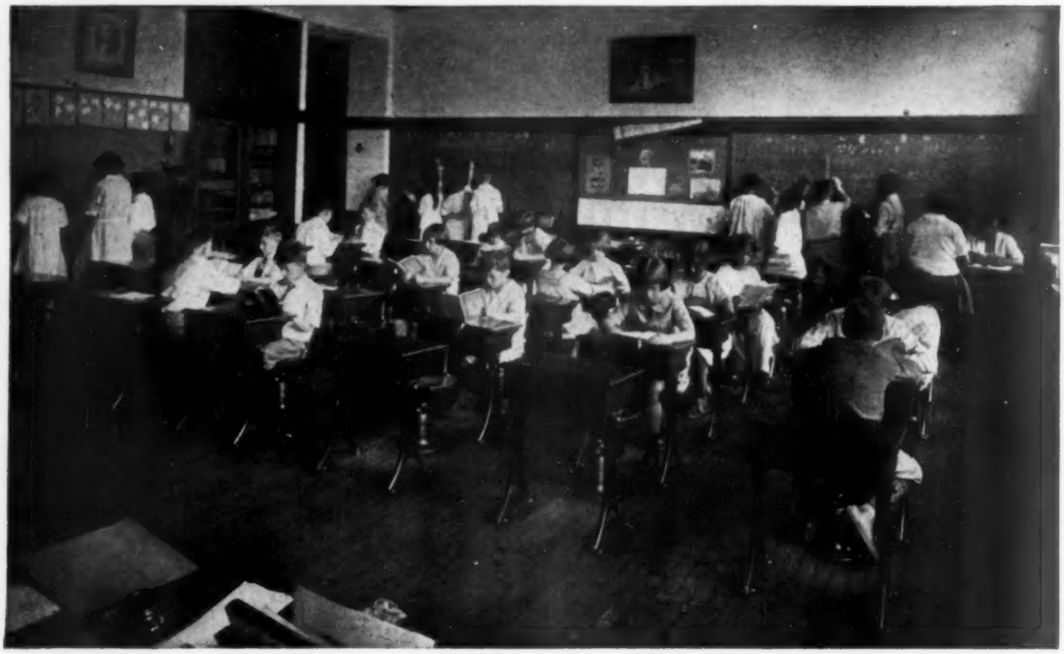


FIGURE 2

brought about a change had to do with the physical well-being of the pupils, and only indirectly with the educational program.

Desks, Fixed, Movable and Adjustable

Figure 1 indicates the common method of seating elementary pupils as late as 1910 to 1915. The type of desk is non-adjustable, but well finished. It is securely fastened to the floor, and the arrangement is in keeping with the philosophy of elementary education in vogue at the time.

As has been indicated, the first important forward step in elementary school equipment came with the introduction of adjustable furniture. These desks were securely fastened to the floor in straight rows with one back of the other. Classrooms were still teacher-dominated.

The carry-over of the philosophy of education from an earlier day is shown in the arrangement of desks in Figure 2. In this picture one sees an attempt at a modern program of education in a classroom provided with adjustable, fixed desks.

About 1917, educational theory began to find expression in more or less radical types of schoolroom equipment. Figure 3 shows desks still arranged row upon row, but the furniture is now of the movable type. It is also adjustable.

The movable type of furniture came as an attempt to provide for a greater amount of freedom and pupil activity in the classroom, and sprang very largely from the socialized recitation.

It was during this early period that janitors raised such a fuss about movable equipment. They said that the rooms were always "mussy," and the furniture out of place. It was a long time before janitors could reconcile themselves to the

FIGURE 3

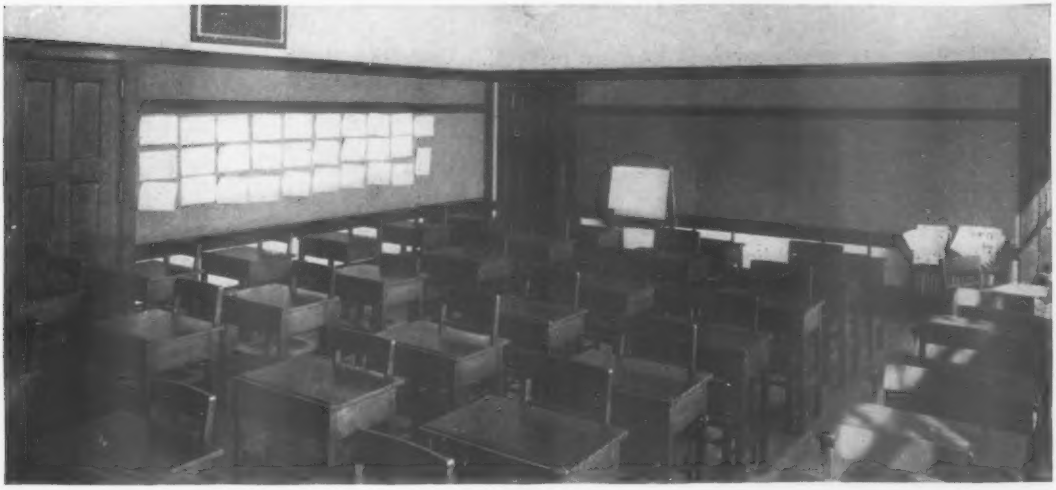


FIGURE 4

fact that school desks could be arranged otherwise than in straight rows. I well remember when it required an order from the principal if the desks were to be left arranged as the teacher wished. The janitors made it a practice to rearrange the desks in rows after sweeping the room. In Figure 3 one does find movable furniture, but with a carry-over of the old practice of teacher-controlled groups, and with little or no genuine provision for freedom and activity on the part of the pupils.

There was very little educational equipment, besides the pupils' and the teacher's desks, to be found in the average elementary classroom up to 1920.

Figure 4 shows a still further departure from the fixed type of desks through the introduction of a separate table and chair for each pupil. The furniture is still arranged in straight rows, and the room has little additional equipment besides the desks and chairs for the pupils. The adjustable feature is gone. Its purposes are being served by variety in the height of desks and chairs. Pupils are seated at desks of the size

FIGURE 5

FIGURE 6

required in each individual case. In a room thus equipped there is little or no space available for the free activity of the children, who ought to be able to move about naturally.

Significant Recent Changes

One of the greatest contributions of educational theory to the elementary school program

FIGURE 7

has come quite recently. It has been only within the last ten years that we have really begun to put into practice Kilpatrick's theory of the whole-hearted participation of the child in problems and projects as a means of educating him.

It is quite a long step from the type of equipment shown in the preceding cuts, and an equally long step from the manner in which it was used, to the type of equipment and its use as shown in the following illustrations. In these one finds single desks and chairs; gate-legged tables to accommodate three, four or five pupils; wood for construction purposes; work benches; easels; wicker furniture; display space; and, what is equally important, a considerable amount of floor space for individual and group project work. In other words, these illustrations indicate the sweeping changes that have occurred in elementary school methods and the attempt to meet these changes by providing equipment which will encourage freedom, initiative and the use of imagination on the part of the children.

Another interesting step in the evolutionary process is shown in Figure 6, illustrating a modern kindergarten.

Still another interesting development in school equipment is the table with two legs. This table, when used with a swivel chair, permits the pupil to sit and to arise without the necessity of pushing his chair back or his desk forward. This type of equipment also lends itself readily to many different arrangements within the classroom. Some possibilities of its arrangement in the room are shown in Figures 7 and 8.

It is a long step from the old slab benches of 1740 to the modernly equipped elementary schoolroom. The significant changes from an educational standpoint have come about because of a better understanding of the laws of learning, and the effort made by school people to make learning a dynamic process. One additional point should be stressed. Instead of the modern schoolroom's being crowded with a desk for each child, it would be far better to eliminate some desks and thus provide free floor space for individual and group projects.

The best classrooms today are not uniformly equipped with any one type of desk or table. In the modern room one finds single desks; desks large enough to seat two, three or four; round tables; large tables; easels; work benches with tools; clay for modeling; wood for woodwork;

FIGURE 8

blocks for building; a library reading corner with attractive books within the reach of children; science equipment; and so on. Such a room provides a laboratory atmosphere which is psychologically correct for the dynamic theory of the learning process. If one studies the trend in elementary schoolroom equipment, he cannot fail to be convinced that every move has been in the right direction, and that we shall probably see other interesting steps taken in the direction of making the schoolroom a still more inviting place in which children may live more abundantly and work together more happily and effectively.

Machine Equipment in a School Superintendent's Office

BY WALTER W. KEMMERER
DIRECTOR OF RESEARCH, HOUSTON PUBLIC SCHOOLS, HOUSTON, TEXAS

IN the proper conduct of administrative tasks, regardless of the size of the organization, two fundamental operations must be performed—writing and computing. These two operations are involved in the routine tasks of school business administration, which can be divided as follows:

1. Budget making
2. Writing purchase requisitions
3. Writing purchase orders
4. Pricing and making extensions on purchase orders
5. Writing stores requisitions
6. Pricing and extending stores requisitions
7. Keeping stores inventory or stock records
8. Writing checks in payment of material purchases
9. Keeping check register
10. Keeping vendors' accounts
11. Keeping invoice register
12. Preparing teachers', janitors', clerks' payroll
13. Writing payroll checks
14. Keeping individual accounts with teachers and other employees paid on a monthly or weekly basis
15. Preparing labor payroll
16. Keeping individual accounts with employees paid on an hourly basis
17. Keeping job cost records
18. Extending time slips
19. Keeping the books of account
    a. Appropriation control
    b. Encumbrance record
    c. Payments
    d. Cost records or analyses
20. Keeping contract ledger

All these jobs, with the possible exception of those concerning stores records, should be performed in a well-conducted business administration, regardless of the size of the system. A capable operator with an understanding of school accounting can, with the help of a typewriter and a calculating machine, perform all these jobs in the smallest school systems. Certain advantages can be secured, however, by the use of a bookkeeping machine equipped with typewriting and calculating devices, which is the only single piece of accounting equipment capable of performing all these tasks.

This article presents types of mechanical equipment which are being used chiefly in financial accounting in school superintendents' offices; it is based on information * obtained by the author from the school systems of thirty-four cities

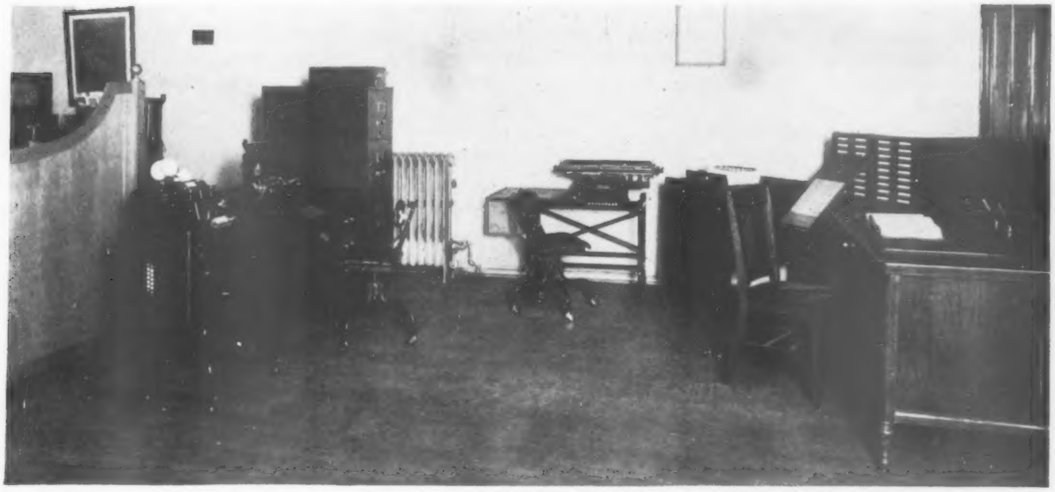
* This study is reported in detail in "School Accounting by Machine Methods," by W. W. Kemmerer, Director of Research, Houston Independent School District, Houston, Texas, 1930. Only one other book on machine accounting, a general treatise on the subject, is known to be available: "Accounting by Machine Methods," by H. G. Schnackel and Henry C. Lang. Ronald Press, New York, 1929.

TYPES OF EQUIPMENT RECOMMENDED

The machine on the left is an electrical adding machine with special printing and totaling features. The electric calculator on the desk is especially convenient for desk use and remarkably easy to operate with speed.

The machine in the center has typewriting and calculating attachments, and is capable of doing all the jobs in a superintendent's office, from writing letters, writing orders as well as making extensions, to posting accounts. It is a direct multiplying machine. Computations can be made with surprising speed.

The bookkeeping machine on the right is primarily a posting machine recommended for larger systems where the volume of posting is sufficient to take the full time of one clerk. Notice the specially constructed chair for the operator.



ADDITIONAL TYPES OF ACCOUNTING AND OFFICE EQUIPMENT
These include an adding machine, at the left; a noiseless typewriter, a bookkeeping machine, a safe file for accounts (avoiding necessity of transferring accounts to a vault), visible card files, and office chairs.

throughout the country, ranging in size from the largest to one of 7,000, and from the business departments of sixteen of the largest universities in the East and Middle West. In addition, a few illustrations are included in the article to show adaptations of mechanical equipment to other phases of the school administration than financial accounting.

The following list suggests the equipment needed by cities of various sizes to perform by machine the tasks enumerated above:

Less than 1,000 total population
- Typewriter

1,000–5,000
- Typewriter and computing machine, or preferably a bookkeeping machine with typewriter and calculating attachments

5,000–30,000
- Bookkeeping machine with writing and computing attachments
- Typewriter
- Adding machine

30,000–50,000
- Bookkeeping machine with computing attachment
- Typewriters
- Adding machine
- Calculating machine

50,000–100,000
- Same as above; or
- Bookkeeping machine
- Addressograph
- Calculating machine
- Adding machine

100,000–500,000
- Order-writing machine
- One to three bookkeeping machines
- Addressograph
- One or two adding machines
- Three to six typewriters
- One or two calculating machines
- Tabulating machine punch
- Counting sorter for statistical analyses and tabulations

500,000 and up
- One separate machine for order-writing
- Two (or more) bookkeeping machines for posting accounts
- One (or more) separate machines for stores records posting
- One Addressograph for check writing, or
- One (or more) special payroll machines
- Installation of punch-card tabulating equipment
- Two (or more) adding machines
- Two (or more) calculating machines
- Typewriters

Writing Purchase Orders

The variations in practice found in the writing of purchase orders and the kind of equipment used in six cities are shown below:

Name of City	Approx. No. of Orders Written Each Yr.	Labor and Time Required to Write the Orders	Name of Machine Used
Chicago, Ill. . .	50,000	7 girls, full time	Typewriter
New York City	45,000	8 men*, full time	Moon-Hopkins
Rochester, N. Y.	22,000	1 girl, ¾ time	Underwood Bookkeeping Machine; Fanfold
Univ. of Mich.	33,151	1 girl, full time	Typewriter
Milwaukee, Wis.	22,500	1 girl, with asst.	Elliott-Fisher
Johnstown, Pa.	2,200	1 girl, part time	Typewriter

* Includes making extensions and all calculations.

Purchase orders are written in the central office. It is feasible, therefore, since all this work of a similar nature is concentrated in one place of execution, to consider the possibilities of writing orders on a machine which is particularly adapted for this work. In the smaller city where the number of orders written is not sufficient to warrant the purchase of a machine for this one purpose, the machine considered must also be able to do all the calculating, computing, writing and bookkeeping tasks.

Differences in buying procedure cause more variation in the number of purchase orders than does the difference in the size of the cities. The smaller city, following the same kind of purchasing procedure for the same educational program, writes almost as many orders as the large city with the quantity of each item correspondingly less.

Payrolls

Allied with the preparation of the payroll are the keeping of individual employees' accounts, making the time report, and posting the salaries

in their proper accounts. If the Addressograph is used in conjunction with payroll work, a payroll can be run off and sent to the principal for his approval and time adjustments. If the Addressograph is not used, the regular payrolls can be copied on a duplicating machine.

Posting Salaries in the Ledger

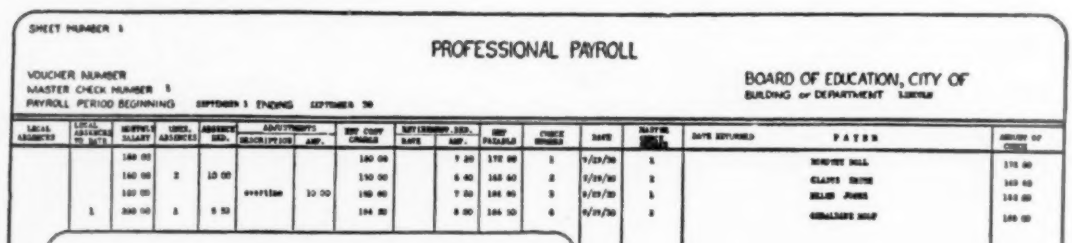
To enter personal service costs in the ledger, many methods are used. The total amount of the payroll may be entered in a lump sum as an instruction charge against the school account, using the payroll for any cost analysis desired. The payroll may be subdivided and posted by activity to the school account. The total amount of the payroll alone may be recorded, using tabulating cards punched for each teacher monthly or annually to get the cost distribution. In some cases tabulating cards are punched for the totals of the different payrolls and used for cost analysis.

The method used greatly affects the amount of work involved. To consider totals of payrolls as the finest subdivision in the determination of costs is impossible if any comparable costs are to be obtained. To try even to approximate true costs, the time distribution and salary cost of each teacher and employee must be considered individually. This may require that the monthly salary of one teacher be allocated to several activities. Punched tabulating cards are sometimes used to get this minute allocation of cost.

Posting the Ledgers Can Be a By-Product of the Payroll

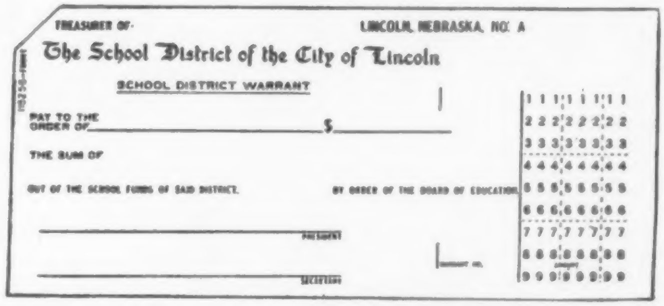
Assuming that the analysis of costs and budget control is desired in great detail, the operation would be as follows:

In making the payroll for School No. 1, for example, teachers could be grouped according to the accounting classification. The checks for all the English teachers could be written consecutively, then those for the mathematics teachers, science teachers, art teachers, etc., making at the same time a carbon copy entry on the employees' individual accounts and another on the payroll. While the checks of the English teachers are being written, the machine accumulates the total. Before the next group of checks is written, the card



PROFESSIONAL PAYROLL, TEACHERS WAGE AND ABSENCE RECORD, PAY CHECK, UNIT COST ACCOUNT, AND LABOR PAYROLL FORMS

account for "School No. 1, English Teachers' Salaries" can be inserted and posted for the accumulated total, clearing the register for the next group of checks. This same procedure is continued for each group of teachers according to the grouping of the accepted accounting classification. If it is not desired that cost be kept by subject or activity, then the only change necessary is that after the complete payroll for the building is written, the school salary account be posted for the total, the operation being identical.



TABULATING CARD CHECK USED IN PAYMENT OF TEACHERS' SALARIES IN LINCOLN, NEBR.

The amount of the check is punched in the check, making possible a tabulation of the salaries, checking of balances, etc., after the return of the cancelled checks.

The combining of the work of the four steps, viz., making the payroll, writing checks, keeping employees' individual accounts, and posting the ledger accounts of cost and appropriation control, with the exception of calculating retirement deductions, can be adapted to any of the bookkeeping machines on the market.

Possible Payroll Procedure in a Complete Accounting System by Machine Methods *

Illustrated are forms drawn up for use with a bookkeeping machine for preparing the payroll, pay checks, posting, teachers' wage and absence record, as well as posting accounts by subject, grade, or school in one operation.

* Complete forms for purchase orders, stores ledger, insurance register, property ledger, check register, general ledger accounts, job cost records, etc., drawn up for use in a complete accounting system set up especially for use with a bookkeeping machine, appear in "School Accounting by Machine Methods."

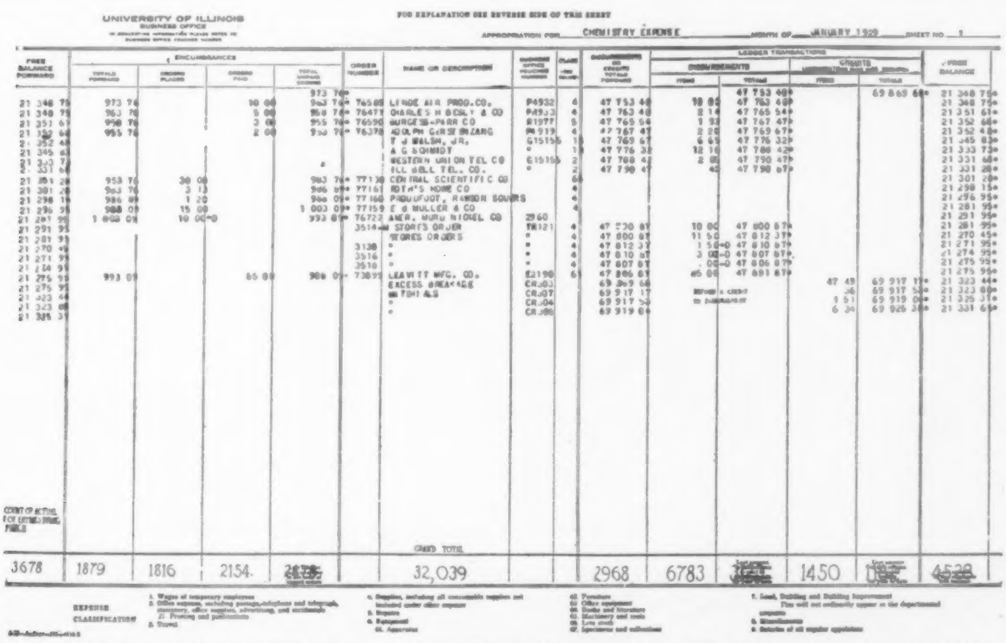
Labor Payroll

The labor payroll is made up from the earnings record cards. The process is somewhat simpler than that of the professional payroll. Less information is needed. The amount of the labor payroll is not entered on the cost records, since this amount has already been entered or is to be entered when the job costs are entered. The labor payroll form is also shown.

Functions of Accounts

The appropriation control sheet or expense sheet controlled by an allotment should show three kinds of information:

1. The unpaid orders or estimates.
2. The total amount of payments.



UNIVERSITY OF ILLINOIS
BUSINESS OFFICE

FOR EXPLANATION SEE REVERSE SIDE OF THIS SHEET

APPROPRIATION FOR CHEMISTRY EXPENSE MONTH OF JANUARY 1929 SHEET NO. 1

Free Balance Forward	Encumbrances: Totals Forward	Orders Placed	Orders Paid	Total Unpaid Orders	Order Number	Name or Description	Business Office Voucher Number	Class	Disbursements or Credits Totals Forward	Disbursements: Items	Disbursements: Totals	Credits: Items	Credits: Totals	Free Balance
				973 76							47 753 40		69 869 66	21 348 75
21 348 75	973 76		10 00	963 76	76580	LINDE AIR PROD. CO.	P4932	6	47 753 40	10 00	47 763 40			21 348 75
21 348 75	963 76		5 00	958 76	76471	CHARLES H BECKLY & CO	P4933	6	47 763 40	2 14	47 765 54			21 351 61
21 351 61	958 76		3 00	955 76	76590	BURGESS-PARR CO	R1977	5	47 765 54	1 93	47 767 47			21 352 68
21 352 68	955 76		2 00	953 76	76378	ADOLPH GERSTENZANG	P4919	4	47 767 47	2 20	47 769 67			21 352 48
21 352 48						T J WALSH, JR.	G15155	1	47 769 67	6 65	47 776 32			21 345 83
21 345 83						A G SCHMIDT	"	1	47 776 32	12 10	47 788 42			21 333 73
21 333 73						WESTERN UNION TEL CO	G15156	2	47 788 42	2 05	47 790 47			21 331 68
21 331 68						ILL BELL TEL. CO.	"	2	47 790 47	42	47 790 89			21 331 28
21 331 28	953 76	30 00		983 76	77130	CENTRAL SCIENTIFIC CO		6						21 301 28
21 301 28	983 76	3 13		986 89	77161	ROTH'S HOME CO		4						21 298 15
21 298 15	986 89	1 20		988 09	77160	PROUDFOOT, RAWSON SOUERS		4						21 296 95
21 296 95	988 09	15 00		1 003 09	77159	E B MULLER & CO		4						21 281 95
21 281 95	1 003 09	10 00-0		993 09	76722	AMER. MOND NICKEL CO	2960							21 291 95
21 291 95					3514	STORES ORDER	TR121	4	47 790 89	10 00	47 800 89			21 281 95
21 281 95						STORES ORDERS	"	4	47 800 89	11 50	47 812 39			21 270 45
21 270 45					3130	"	"	4	47 812 39	1 50-0	47 810 89			21 271 95
21 271 95					3516	"	"	4	47 810 89	3 00-0	47 807 89			21 274 95
21 274 95					3518	"	"	4	47 807 89	1 00-0	47 806 89			21 275 95
21 275 95	993 09		65 00	928 09	73899	LEAVITT MFG. CO.	E2190	6	47 806 89	65 00	47 871 89			21 275 95
21 275 95						EXCESS BREAKAGE	CR303		69 869 66			47 49	69 917 15	21 323 44
21 323 44						MATERIALS	CR307		69 917 15			36	69 917 51	21 323 80
21 323 80						"	CR304		69 917 51			1 51	69 919 02	21 325 31
21 325 31						"	CR308		69 919 02			6 34	69 925 36	21 331 65
COUNT OF ACTIVE FOR ESTIMATING PURPOSES						GRAND TOTAL								
3678	1879	1816	2154	[illegible]		32,039			2968	6783	[illegible]	1450	[illegible]	4528

EXPENSE CLASSIFICATION: 1. Wages of temporary employees. 2. Office expenses, including postage, telephone and telegraph, stationery, office supplies, advertising, and incidentals. 21. Printing and publications. 3. Travel. 4. Supplies, including all consumable supplies not included under other expense. 5. Repairs. 6. Equipment. 61. Apparatus. 62. Furniture. 63. Office equipment. 64. Books and literature. 65. Machinery and tools. 66. Live stock. 67. Specimens and collections. 7. Land, Building and Building Improvement. This will not ordinarily appear in the departmental accounts. 8. Miscellaneous. 9. Salaries of all regular appointees.

AN ACCOUNT FORM ADAPTED TO A BOOKKEEPING MACHINE BY THE UNIVERSITY OF ILLINOIS

PART OF THE EQUIPMENT OF THE PAYROLL OFFICE OF THE HOUSTON INDEPENDENT SCHOOL DISTRICT, HOUSTON, TEXAS

Addressograph plates are used, with tabs which can be adjusted to prevent the salary from printing when adjustments for absences or other reasons are necessary. In this manner new plates are not made of irregular adjustments. Two clerks handle all the payroll work of more than 2,000 employees. Teachers' salaries and absence records are kept on individual cards in visible book file.

3. The free balance, which is the difference between the appropriation or allotment and the sum of the payments and unpaid orders.

An objection is sometimes raised to machine forms because the entry for the actual payment is not made on the same line as the entry for the order or estimate. It is true that machine-kept records, as shown in Figure 4, do not make the entry for the payment on the same line as that on which the order, requisition, or estimate was entered. Everything is entered in chronological order. The payment of an order, which is usually termed "liquidating the order," may be entered five or more lines below the original entry, or it may be on the next sheet. It is always given the same number as the order, however, so that reference can be made to the two entries to determine the amount of the order and the amount of the payment. This naturally takes a little more time than would be the case if both entries were made on the same horizontal line as in the hand accounts.

Accounts Should Show Payments and Free Balance

No bookkeeping machine on the market can make the entry for the order and payment on the same line when these two transactions do not happen at the same time, and still show the three kinds of information necessary. Hand-kept records making both entries on the same line do not show such information currently; it must be calculated when desired.

The choice then lies among the three following methods: (1) making the entries for the order and its respective payment on the same horizontal line, furnishing convenient reference, but not having available the three types of information listed above; (2) making the entries for the order and its respective payment wherever they happen to come chronologically, with reference to the two possible by means of the order number; and (3) having the three types of information always available.

The answer is unquestionable. The function of an account is to show, at least, the amount of the payments and the free balance. This information is of more importance and is more frequently desired than is the need of seeing together the amount of the estimate or order and the amount of the payment of a particular transaction. Any one concerned in the particular account can find out all the vital information without having the two entries made on the same line. In fact, even if the accounts are to be kept by hand, it would be more convenient to make the entries not on the same line if totals are desired after each day's entries.

Radio for Schools

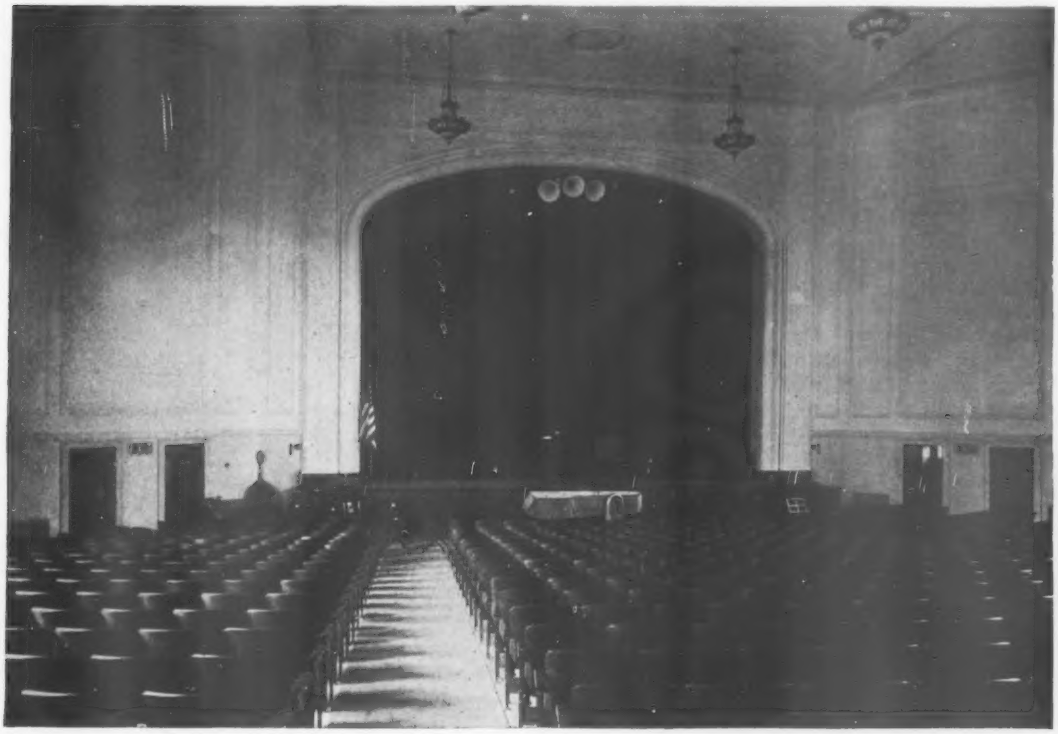
BY EDWARD C. BLOM
DIRECTOR OF RESEARCH, PUBLIC SCHOOLS, LOUISVILLE, KY.

RADIO as a means of instruction was utilized in some schools about ten years ago. Individual experimenters began their work as soon as broadcasting was commercialized. Although at first no attempts were made to reach large numbers distributed over extended areas, until the Federal Radio Commission in 1927 restricted the number of broadcasting stations it was easy for those interested in educational programs to obtain a time allotment from some local station.

Many changes have taken place since then, however, particularly during the last few years. The small local stations have been discontinued or converted into powerful units, often associated with commercial chain stations. Naturally, the directors of educational programs have been forced to present material which would appeal to people in widely separated localities. Until recently this meant that the school could obtain through its receiving set only entertainment features and material of general interest. Consequently, educators lost interest in the use of radio in schools, even to the point where the radio was considered a nuisance. There was no apparent way in which so-called educational programs could be made an integral part of classroom work.

Educators Slow to Appreciate Value of Radio

So general was this attitude on the part of educators that until last year many of the influential members of the National Education Association did not deem it worthwhile to bother about what was going on in the field of educational broadcasting in the United States. The initiative was taken generally by commercial firms. It is true that there were some state and local undertakings not sponsored by business organizations. Their influence, however, was not nearly so far-reaching as that of the Damrosch concerts and the American School of the Air programs broadcast by the two major chain stations. The Damrosch programs are now being received in approximately 150,000 classrooms.



Courtesy of the Graybar Electric Company.

THE PUBLIC ADDRESS EQUIPMENT IN THE AUDITORIUM OF THE FAR ROCKAWAY, N. Y., HIGH SCHOOL, INCLUDING LOUD SPEAKER HORNS, MICROPHONE AND RADIO RECEIVER

The horn-type loud speakers located at the top of the proscenium arch are used to direct the sound to various parts of this large auditorium

Courtesy of the Baritone Manufacturing Company.

CLASSROOM EQUIPPED WITH LOUD SPEAKERS RECESSED IN THE CEILING, SHELBY, MICH.

Here several less powerful magnet loud speakers are used in order to obtain even distribution of the sound throughout the room. This manufacturer allows one loud speaker for each 2,000 cubic feet of room space

to radio programs, distributed 35,000 questionnaires and received 7,175 replies. These replies indicate, among other tendencies, that the listeners want educational features, and that 90 per cent of the children in the homes from which replies were received listen to the radio.[1]

The fact that such a large percentage of children "listen in" is a challenge to the schools to train children in the intelligent use of this new instrument. Until some effective means is devised for meeting the expenses involved in broadcasting educational programs in the United States so that the objectionable features of commercial advertising may be eliminated, it certainly seems desirable to teach children, and adults as well, to select and appreciate those features which are educational. This is one way in which the school can contribute to education for the worthy use of leisure time.

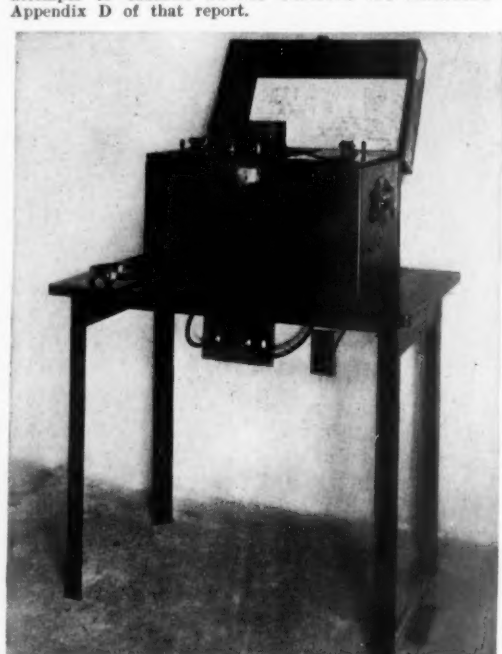
Now we find that at least some of the influential members of the National Education Association have become vitally interested in educational broadcasting, even to the extent of advocating Federal action to insure a definite percentage of broadcasting time being given to strictly educational programs. A National Advisory Council on Radio in Education has recently been formed with the backing of John D. Rockefeller, Jr., and the Carnegie Corporation. The Council, of which Dr. R. A. Milliken of California Institute of Technology is President, expects "not only to collect and study programs regardless of their source, but also to devise means for more effective programs and to compare progress in education by radio in this country with educational broadcasting abroad."

These developments have been distinctly worthwhile from the standpoint of the use of the radio in connection with school work. The directors of commercial broadcasting stations have found it advisable to call in educators to assist them in planning educational programs, and the educational administrators have been brought to a realization of the educational potentialities of the radio. The Federal Radio Commission recently estimated that what may be called educational programs take up 10 per cent of the time radio stations are "on the air."

What Do Listeners Want?

In general, broadcasters attempt to include in their programs features which their listeners want. Recently the Commonwealth Club of San Francisco, in an effort to appraise listeners' reactions

[1] P. 40, "Report of the Advisory Committee on Education by Radio."—United States Department of the Interior, Washington, D. C., 1930. Other methods and attempts to examine listener reactions are mentioned in Appendix D of that report.



Courtesy of the Graybar Electric Company.

A PORTABLE CENTRAL STATION UNIT OF THE PUBLIC ADDRESS SYSTEM IN THE FAR ROCKAWAY HIGH SCHOOL

Other parts of this installation are shown in the picture of the auditorium on the preceding page

The Extent of Educational Broadcasting

Educational broadcasting in some foreign countries, notably Great Britain, Germany, Austria and Scandinavia, has progressed rapidly under a governmental monopoly of the broadcasting facilities. In other countries like the Netherlands, Belgium, France and Spain, there exist problems similar to those which the educators of our own country must face. In the United States, in spite of many obstacles, educational broadcasting has been and is now being carried on quite extensively. According to the report of the Federal Advisory Committee on Education by Radio,[2] 77 of the 627 licensed broadcasting stations are owned and operated by educational institutions, and 15.2 per cent of all broadcasting in this country appears to have an educational purpose. Eight State Departments of Public Instruction report repeated use of broadcasting for educational purposes. The most outstanding state projects are those carried on in South Dakota and in Ohio.

Participation in Broadcasting Valuable

In the case of most broadcasting projects, whether local, statewide or national in scope, the pupils and teachers in the schools take little or no part in presenting the programs; they are listeners. Under these conditions the pupils and teachers get only part of the benefits to be obtained from the use of broadcasting in connection with school work. There should be an opportunity for performing as well as for listening.

For the past two years the writer has been closely associated with a project in which the children and teachers in the public schools prepare and broadcast programs.[3] The accompanying photograph shows a 2A grade class broadcasting a Thanksgiving program. The following summary, based on a study of the reactions to these programs, indicates some of the benefits to be expected by teachers, pupils and others interested in education, as a result of the broadcasting of public school programs.

The teacher gains:

1. Skill in preparing a project having exacting requirements.

2. A stimulus to do her best. She realizes that her efforts will come to the attention of many people outside of her immediate school circle.

3. An opportunity to share the experiences of others doing work similar to her own, thus giving her new ideas and an appreciation of the worthwhileness of her own work.

4. An intimate understanding of the children in her charge.

5. First-hand experience in the use of a medium which is rapidly being introduced into many schools.

The children gain:

1. A real motive for the careful use of spoken and written English. They appreciate the need for concise and well-organized sentences. They realize the necessity for clear enunciation, correct pronunciation and proper expression.

CHILDREN BROADCASTING A PUBLIC SCHOOL THANKSGIVING PROGRAM

The children of the 2A grade of Belknap School, Louisville, Ky., radiocasting a program over WHAS, the radio station of the Louisville *Courier-Journal* and Louisville *Times*

2. An ideal outlet for their efforts at the culmination of a project. They have a chance to share in a large way the ideas and experiences which they have gained in working on their project.

3. Concrete impressions of what happens in the studios of an industry which exerts an influence in practically every home today.

4. An introduction to a possible future vocation.

Everyone interested in education gains:

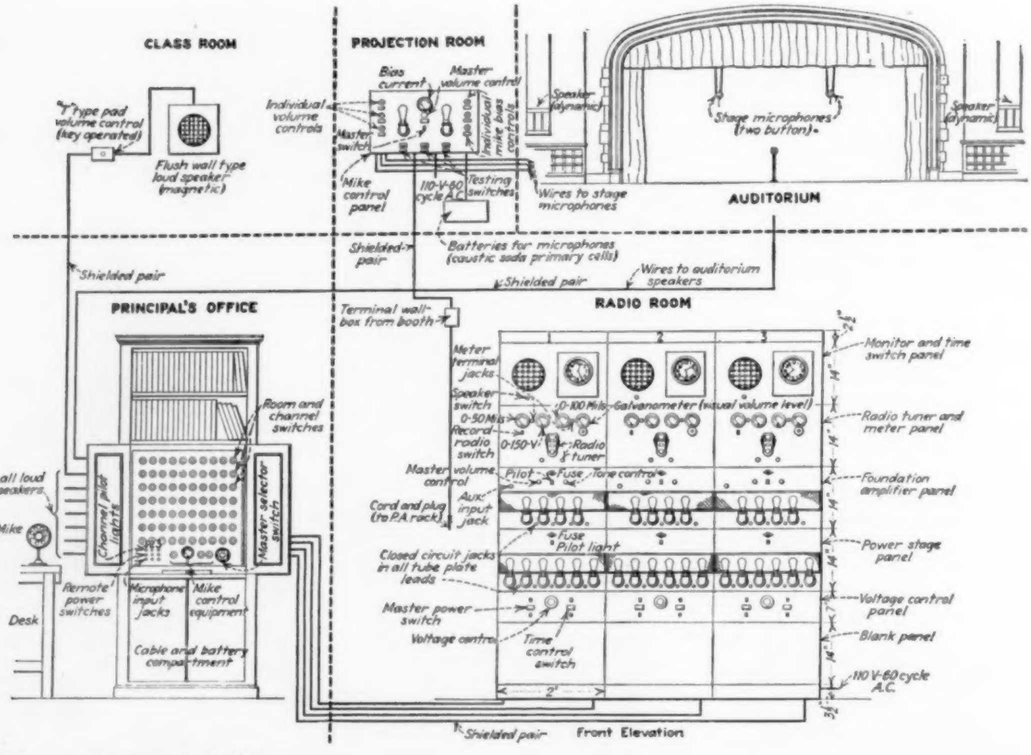
1. An acquaintance with the activities of the school; the accomplishments of the school are translated into terms of activities by the pupils. This type of educational publicity is wholly desirable and worthwhile. The schools place their wares before the public in such an extensive way as would hardly be possible through any other medium.

2. An explanation of school procedure, of the goals which pupils attempt to reach, and the means by which they hope to attain these goals.

3. An understanding of the policies which underlie the education being given to children. Most

[2] *Op. cit.*, p. 30.

[3] "The Radiocasting of Public School Programs," by Edward C. Blom. Bulletin No. 1, January, 1931. Bureau of Research, Board of Education, Louisville, Ky.



Courtesy of the Superior Seating Company

SCHEMATIC DIAGRAM OF THE COMPLETE SYSTEM INSTALLED IN THE WHITE PLAINS, N. Y., HIGH SCHOOL
This is a three-channel system, installed at a cost of $14,600 exclusive of basic wiring

fathers and mothers now have misapprehensions about school policies.

Every effort should be made to offer the children and teachers the opportunities which may be expected from actual participation in broadcasting. Although it is not at present possible for schools to make much use of the regular broadcasting facilities, many desirable results can be obtained in schools where one or more microphones are part of the centralized radio equipment.

Recommendations Based on Experience

The experience of educators who have used radio equipment in schools seems to indicate that centralized radio equipment is more desirable than individual sets. Of the four common types of input to the centralized system, the radio and the broadcasting microphone are more useful than the close-talking telephone and the phonograph. Classroom reception of radio programs has been found better for instructional purposes than assembly hall or auditorium reception.

Adequate provisions must be made to minimize the chances of radio equipment being stolen or damaged. The principal and office assistants usually assume the responsibility of supervising the central station equipment. When an electrician is employed in the building he is often placed in charge of the equipment. The maintenance problems are not significant. Except in very large buildings there is no need for receiving more than two programs simultaneously. Speech and music amplification systems are useful in large auditoriums, gymnasiums, and cafeterias.

Since the use of radio in connection with school work seems inevitable, educational administrators are faced with the problem of selecting suitable equipment. In order to meet the need for information concerning this new kind of equipment for schools, the writer made a study of radio equipment with the idea in mind of determining its adaptability for such a use.[4]

Considerations in Selecting Equipment

The following are some important considerations in the selection and installation of radio equipment:

1. *Safety.*—The installations should be such that the health of the children will be protected and their safety assured.

[4] "Radio and Electric Power Supply Equipment for Schools," by Edward C. Blom. Bureau of Publications, Teachers College, Columbia University, New York, 1930.

2. *Simplicity.*—This characteristic is important from the standpoint of design and construction as well as desirable for ease and certainty of operation.

3. *Standard Materials and Equipment.*—Replacements, additions, and general servicing requirements can be readily provided when standard materials and equipment are used.

4. *Appearance.*—Other things being equal, the equipment selected should be pleasing in appearance, harmonizing with the architecture of the building and with the other furniture in the rooms.

5. *Adequate Capacity.*—Installations should be made so that the maximum demands can be met without affecting the quality of the service.

6. *Adequate Protective Devices.*—All equipment should be protected against mechanical and electrical injury. Provisions should be made to minimize possible loss due to theft.

7. *Flexibility.*—The design and arrangement of equipment should facilitate ready and easy control of the various services as well as provide for probable future extensions and improvements.

8. *Servicing.*—No equipment should be installed for which prompt and efficient servicing cannot be obtained.

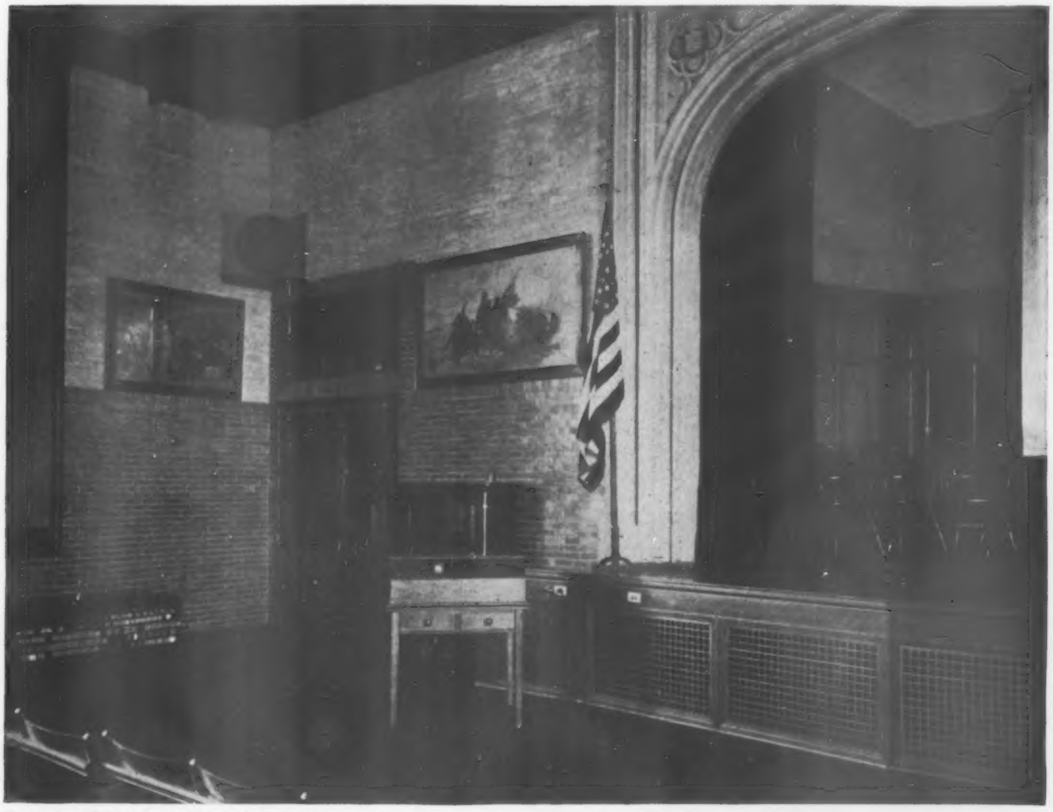
9. *Supervision of the System and of Programs.*—The installation should facilitate control under the organization of the school system.

10. *Acoustics.*—In the placing of loud speakers and microphone equipment every effort should be made to eliminate troublesome reverberation and other cataphonic effects.

Kinds of Equipment Needed

For use in schools it seems desirable to install a centralized audio frequency distribution system with loud speakers in all the classrooms. The central control station might be in or near the principal's office. If this station is in the auditorium, it might be in the motion picture booth or in a room off the side of the stage. Flush-type wall-mounted loud speakers are desirable.

For use in ordinary classrooms the magnetic loud speakers are satisfactory. In auditoriums, large assembly rooms, cafeterias and gymnasiums, dynamic loud speakers should be used. The input service should provide for radio reception,



Courtesy of the Samson Electric Company

AN AUDITORIUM INSTALLATION IN THE FRANK A. DAY JUNIOR HIGH SCHOOL, NEWTONVILLE, MASS., SHOWING A CONE-TYPE LOUD SPEAKER IN THE CORNER OF THE ROOM AND AT THE SIDE OF THE STAGE OPENING

Sound-absorbing material is placed behind this loud speaker to minimize the reflection effects from the walls in that vicinity

Courtesy of the Radio Corporation of America

CENTRALIZED RADIO INSTALLATION, OYSTER BAY, N. Y., HIGH SCHOOL
Here the auditorium loud speakers are concealed in the organ lofts on each side of the stage opening

phonography record reproduction, a broadcasting microphone, and a connection with the incoming telephone lines from remote points. Record-recording devices are valuable when suitable equipment can be obtained.

In big auditoriums and other large spaces, adequate provisions should be made for speech and music amplification. It is desirable to have controls which will enable the operator to impress any one of the programs on any or all of the loud speakers as desired. The equipment should be designed to operate by the same power that is supplied to the electric lighting circuit. In rooms like auditoriums, which are used by large audiences, the equipment should include provisions for amplifying the words spoken on the stage.

Typical Installations

The accompanying photographs show types of radio equipment used in schools. They illustrate installations of various degrees of elaborateness, from the three-channel centralized audio frequency system to the single auditorium unit. With the three-channel arrangement it is possible to transmit three programs simultaneously to different parts of the building, thus giving a very flexible installation particularly well-suited to secondary schools. The makers of individual units as well as those who assemble the central station equipment on panel boards have provisions for all the kinds of input service mentioned in a preceding paragraph.

When many schools have been furnished with equipment like that described above, the use of radio and allied services can be carried on in a systematic way. With the equipment that is now on the market for use in schools, it is possible to use loud speakers and associated equipment along with moving picture apparatus to give the children the advantages of sound pictures. Further developments are necessary before television can be used effectively in the schools.

The Advantages of Centralized Systems

The writer advocates the installation of centralized audio frequency distribution systems because they provide a variety of services and at the same time offer adequate means for supervising the programs. The cost of these systems is not excessive, particularly when they are installed in new buildings. Many schemes are now being used for equipping old buildings in which there are bell systems, phone systems, etc. J. C. Duff used the bell circuits for the audio frequency distribution system.[5] Many of the good radio receivers and assocated amplifiers are sufficiently powerful to be used with several loud speakers.

When centralized systems are used, it is possible to do broadcasting within the school system. This kind of broadcasting has many advantages when the teachers and pupils take part, as suggested above. Controlled experiments to determine the actual results produced can be readily conducted in this way. While centralized systems have distinct advantages over individual

[5] "Radio as a Means to Instruction," by J. C. Duff. *School Executives Magazine*, Vol. 48, No. 5, January, 1929.

sets placed in the classrooms or auditoriums, much good can be obtained from the use of individual sets. The Kent County experiments[6] were conducted with the use of individual sets. In these experiments it was found that good results educationally were obtained with the use of head phones. An arrangement with provision for head phones for each child might prove very valuable for children who have hearing difficulties.

Radio of Unusual Value to Rural Schools

During the past two years Margaret Harrison, of Teachers College, Columbia University, conducted an investigation in the use of radio in rural schools.[7] Her studies led her to believe that radio offers material in the form of news, orchestral programs, dramatizations of stories and the like, such as the average rural school could get in no other way; it sets up standards of speech, selection of material and opinion which, while not all that the investigators could wish, are yet higher than most of those now in effect; it gives the schools a new tool for increasing the "number, variety and intensity of interests"; it gives the rural child a new viewpoint besides that of his teacher, textbooks and parents, and it brings national and international interests to the local environment.

[6] "Educational Broadcasting."—Report of a Special Investigation in the County of Kent during the year 1927. The Carnegie United Kingdom Trustees, Comely Park House, Dunfermline, Scotland, 1928.

[7] "Radio in Rural Schools—An Investigation," by Margaret Harrison. Radio Research Bureau, Teachers College, Columbia University, New York, 1930.

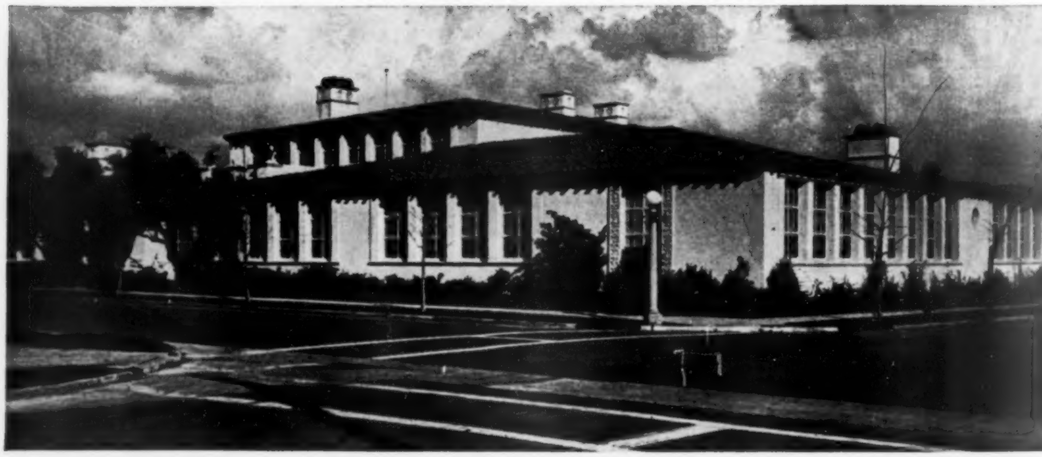
The Future of Radio

The intense interest which is now being manifested by many professional educators and by the officials of the large broadcasting companies, combined with rapid developments in the manufacture of radio equipment for school use, seems to indicate that education by radio will become very important in the near future. In fact, it is difficult to estimate the real value of this new medium when consideration is given to the important rôle that adult education, part-time and extension education will probably play in the large educational scheme. Schools of today have facilities far beyond anything even dreamed of a short time ago, and the future seems to hold even greater possibilities. A genuine challenge is placed before professional educators to use these new facilities to the best advantage.

Courtesy of the Stromberg-Carlson Telephone Mfg. Co.

THE AUDITORIUM OF THE WATERVILLE, N. Y., HIGH SCHOOL

The portable sound projector seen in the center of the stage is used as a reproducer in cases where no architectural provisions have been made on either side of the proscenium for built-in dynamic speaker units



Classroom Innovations in the Horace Mann School, Beverly Hills, Calif.

BY ROY SELDON PRICE
ARCHITECT, BEVERLY HILLS, CALIF.

THE typical classroom in the Horace Mann School at Beverly Hills, Calif. (29 x 23 feet), effects a saving of 2½ feet in the length of the room, as compared with standard classrooms of the same capacity and same accommodations. The saving was accomplished chiefly by an innovation on the part of the architect in the design of the wardrobe end of the room.

The customary classroom wardrobe in California is a closet separated from the classroom by a

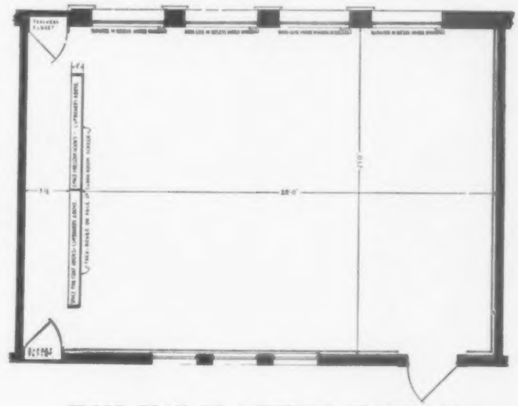
CLASSROOMS IN THE HORACE MANN SCHOOL

The view at the left shows the wardrobe screen in a typical classroom. The cupboards above the screen, which is 3½ feet from the wall, are 9 inches deep. The drawing is tacked on a tackboard which covers the screen on the classroom side. In two special classrooms, one of which may be seen at the right, it was necessary, because of the size of the rooms, to use another type of wardrobe, without a screen.

plaster wall, with a separate teacher's closet at one end. This is not an ideal arrangement, as the wardrobe lacks circulating air and sunshine. Not only is the closet usually a catch-all, but the classroom is unsymmetrical and unattractive.

In the Horace Mann School, the plaster partition has been replaced by a wood screen, 7 feet high, extending almost across the width of the room. The screen is covered on the classroom side with cork board and on the other side with a smooth sheet of heavy cardboard, to which coat hooks are fastened. The customary dust ledges resulting from hook strips are thereby avoided. The upper 18 inches of the screen contains a continuous row of cupboards facing in the classroom. The upright members of the screen (2 x 8 feet) are rigidly anchored to the floor, but a 6-inch open space below the screen allows for better circulation of air. The wardrobe end of the classrooms is sunnier and more attractive because of the omission of the plaster partition.

The teacher's closet has been replaced by two closets approximately 12 inches deep, recessed in the structural walls at either end of the wardrobe. One of these is for the teacher's personal effects and is fitted with coat hangers, mirror, shelves, etc. The other closet has an adjustable shelf for paper, pencils, supplies, etc.



FLOOR PLAN OF A TYPICAL CLASSROOM

Most California classrooms have a 12-inch bookcase above an 18-inch cupboard on the classroom side of the wardrobe partition. This floor space has been saved in the Horace Mann School by recessing bookshelves underneath two of the classroom windows in the concrete wall. Recessed under the other two windows are steam radiators of the new phantom type, fed and dripped directly through the floor of the recess, thereby

Roy Seldon Price, Edward Cray Taylor and Ellis Wing Taylor, Associate Architects

THE FLOOR PLAN OF THE HORACE MANN SCHOOL

avoiding an unsightly horizontal or sloping pipe. Deep shelves for drawing paper, etc., have been provided in cabinets built in the bottom of the teacher's table.

Care was taken in designing the doorways of the Horace Mann School. The door jambs extend clear through the thickness of the corridor wall, with casings 7½ inches wide inside and outside. The primary purpose of this arrangement is to withstand hard knocks over a period of years. It was found possible, however, with some effort, to center all the electric switches, thermometers and inner communicating telephones within these 7½-inch casings, so that the blackboard and tackboard on either side of the doorway are left unobstructed. In place of the customary transom over the door, a group of four pivoted steel windows has been provided over the blackboard on the corridor wall. This arrangement not only allows more ventilation and borrowed light, but makes a much better looking doorway. The windows are of the universal awning type, fitted with Venetian blinds.

The walls and ceilings of the classrooms are of smooth-textured, hard, wall plaster, integrally colored in soft shades of ivory and grey-green, depending upon the classroom exposure. All plaster painting is eliminated and the dust-collecting possibilities of rough sand-finished plaster are avoided.

(For a description of the cafeteria and kitchen layout in The Horace Mann School, see Section VIII.)

A TYPICAL CLASSROOM
The door casings carry the electric switches, thermometers and inner communicating telephones

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Acoustical Treatment—The Celotex Co. and Samuel Cabot, Inc.
Auditorium Seating—American Seating Co.
Blackboards—Natural Slate Blackboard Co.
Boilers—American Radiator Co.
Clocks and Signal Systems; Fire Alarms—Pacific Electric Time Co.
Interior Telephone Equipment—S. H. Couch Co.
Library Equipment—Yawman & Erbe Mfg. Co.
Lockers—Durabilt Steel Locker Co.
Plumbing Fixtures and Sanitary Equipment—Crane Co.

Health Clinics in Public Schools

BY JAMES FREDERICK ROGERS, M. D.
CONSULTANT IN HYGIENE AND SPECIALIST IN HEALTH EDUCATION,
U. S. OFFICE OF EDUCATION

HEALTH examinations in public schools, whether medical, dental, or mental, are now usually conducted in halls, in classrooms or in some temporarily vacant room none too suitable for the purpose. Examinations can, however, be made most efficiently and economically when proper facilities are available. Parents are now invited (or should be invited) to be present, and this makes it the more essential that special rooms, including a waiting room, be provided. When not used for physical or mental examinations, the rooms should be given over to the nurse for first aid or for treatment of special cases.

Health clinics should consist of at least a waiting-room and an examining-room. The waiting-room should open into the examining-room, and the latter should have a door into the hall through which the parent and child can depart. The rooms must have good light and be convenient of access, but located in a quiet part of the building, away from the noise of street and classrooms. The possibilities of good ventilation should not be overlooked, and the heating equipment should be sufficient to raise the temperature to at least 75°. The waiting-room should be of ample size, not under 12 feet square, with a table on which health literature can be displayed, and with chairs for a half-dozen or more persons.

If possible, the examining-room should be 21 or 22 feet long. This allows the usual distance of 20 feet for testing vision with the Snellen chart. A room otherwise more desirable, even as short as 12 feet, can be used. While there should be abundant natural light for other examinations, the eye card should be illuminated with lamps of standard

strength, renewed as needed. The best lighting is obtained with light-reflecting walls, although the walls need not be white. The room should be cheerful and not suggestive of a hospital or operating room.

Opening from the examining-room there should be a toilet with all lavatory facilities. This may also be connected with the waiting-room, as in Fig. 1. A small clothes closet would be desirable if it could be included in the layout.

An examining-room should contain a set bowl and towel-rack. There should also be a couch. A revolving stool should be provided for the child and an adjustable chair for the examiner, with one or two chairs for parents. Other equipment should include scales and a measuring rod, a cabinet for a few instruments and first-aid materials, a sterilizer, a movable bowl, waste-basket, etc. If the pupils' record cards are kept in the room, suitable cases for filing are necessary.

The room for medical examinations can also serve for mental examinations provided it does not possess the odor (physical or mental) of medicine. The room and its furniture should be cheerful, homelike and quiet, so that the pupil need not feel that he is "being examined." The atmosphere should, in a word, inspire confidence. If a special room other than that used for medical examinations is set apart for mental examinations, it need not be large. Books, pictures, plants, a bowl of goldfish, etc., will add to its attractiveness and normality. Any special examining apparatus will, of course, be selected by the examiner.

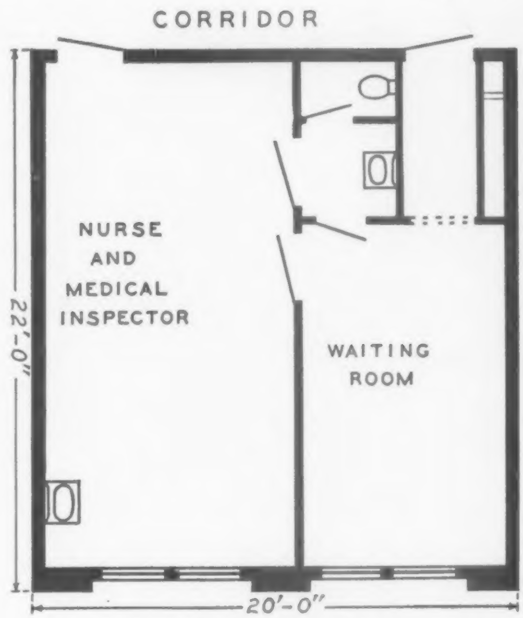


FIG. 1. A RECOMMENDED LAYOUT FOR SCHOOL MEDICAL INSPECTIONS

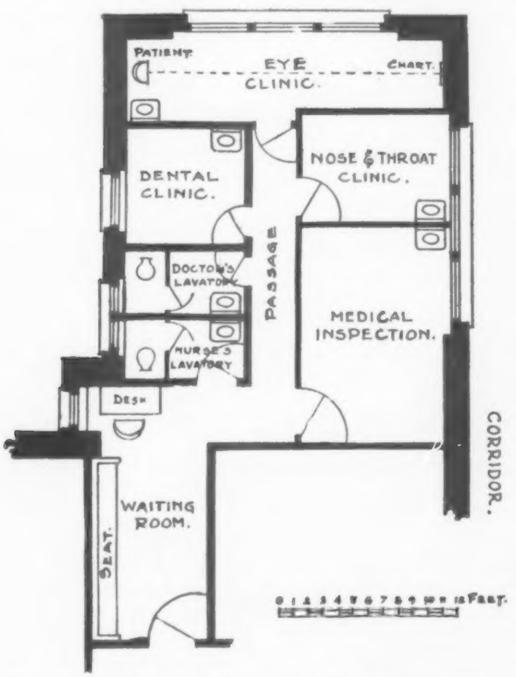


FIG. 2. THIS LAYOUT FOR A GENERAL MEDICAL CLINIC FOR A LARGE SCHOOL IN NEW YORK CITY INCLUDES PROVISIONS FOR SPECIAL EXAMINERS

(Reproduced from "Standardization of Medical Inspection Facilities," by J. H. Berkowitz, Office of Education Bulletin, 1919, No. 2.)

Where dentists are employed in schools, they usually work full time. For this and other reasons it is not advisable that the rooms for medical or mental examinations should also be used by the dentist or dental hygienist. The dentist's room could, however, adjoin and connect with the medical room, and routine dental examinations could follow the medical examinations. Although good illumination is important for dental examinations, quiet is not so essential.

The equipment for special dental examinations consists chiefly of a special chair and attachments, a good source of artificial light, and a stand and case for such examining instruments as are needed. A sterilizer should be a part of the equipment as well as ample facilities for cleanliness on the part of the examiner. In most cases the dental examining-room will also be the treatment room, and the above equipment will be supplemented according to the kinds of dental work done. For a complete outfit, an X-ray room and equipment would need to be added. The entire dental outfit should be selected by the dentist in charge.

Where other special examiners are employed, or where treatment for diseases or defects is given, the equipment of rooms will need to be elaborated accordingly. One of the largest and best equipped clinics includes, besides rooms for eye, ear, nose and throat examinations, a room for metabolism tests, a laboratory and a room for orthopedic examinations and treatment.

Furniture and Filing Apparatus for Principals' Rooms

BY FRANCIS C. BUROS

DIRECTOR OF RESEARCH, BOARD OF EDUCATION, WHITE PLAINS, N. Y.

IT is being recognized by many that the type of furniture and filing equipment provided in the office suite will determine to a certain extent the degree to which the office will be able to function properly and efficiently. The report of the Committee on Standards and Training for Elementary School Principalship of the N. E. A.[1] emphasizes the importance of adequate facilities to the efficient functioning of the principal. Woellner and Reavis[2] found that "on the whole there is a fair distribution of office facilities in the schools of all sizes. Many complete and well-arranged offices are to be found in the smaller schools. It can therefore be assumed that the date at which a school building was erected often has more to do with the office plan than does the enrolment of the school." This finding was corroborated by Green[3] in a study of the school office facilities in 185 schools.

Reavis and Woellner[4] and Morrison,[5] as well as the above studies, set up standard facilities and minimum facilities for the school principal's offices.

[1] The Seventh Yearbook, Department of Elementary School Principals.—National Education Association, Washington, D. C. 1928.

[2] Woellner, Robert and Reavis, W. C.: "Architectural Plans of Administrative Offices in Secondary Schools."—*School Review*, 37: 37-43, January, 1929.

[3] Green, Rhue E.: "The Office Suite of the High School Principal."—*American School Board Journal*, 80:70-71, January, 1930.

[4] Reavis, W. C. and Woellner, Robert: "Labor Saving Devices Used in Office Administration of Secondary Schools," *School Review*, 36: 736-744, December, 1928.

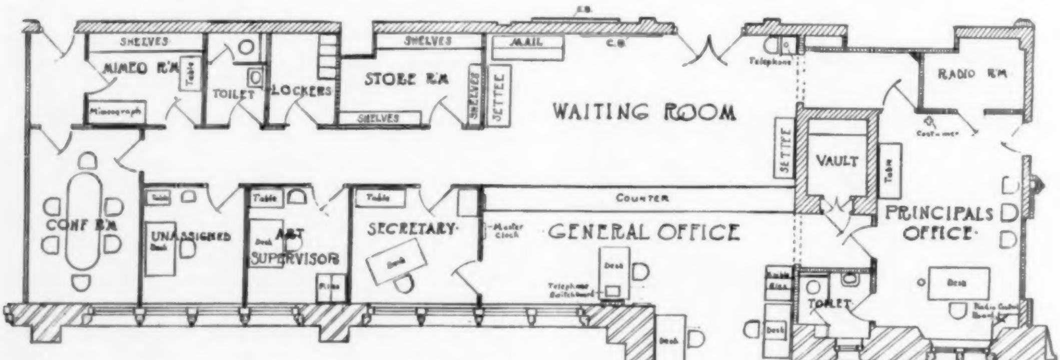
[5] Morrison, J. C.: "The School Principalship," in Ohio State University Contribution in School Administration, No. 2, May 15, 1926. pp. 41-42.

Practice and Experience in the White Plains Schools

In planning the furniture and filing equipment for the principal's offices of the White Plains public schools, these standards and suggestions have been borne in mind and to a large extent carried out. Some special features have been incorporated. A description of the set-up for the High School will hold true to a major extent for the junior high schools and the elementary schools built since that time in White Plains, except that the furniture has not been so elaborate.

There is a main office, connected directly with a main corridor to the left of the main entrance. This serves as a main office and workshop. It is divided into two parts by a public counter. Up to the time of construction of this building, a fence or wooden counter had been used to separate the workroom from the students served. In this building it was decided to use a steel counter having a linoleum top. The counter, being 42 inches high and 27 inches deep, would house any steel files and storage cabinets desired. At first a gate was to be used, but after careful consideration this was omitted, making it necessary to go through the secretary's office to get behind the counter.

The section of the office reserved for the public is equipped with several benches for those waiting for conferences. Here a bulletin board is provided for notices for the teachers. On a table in one corner of the room is placed a mail box, in which a compartment is provided for each teacher.



LAYOUT OF THE PRINCIPAL'S OFFICES IN THE WHITE PLAINS HIGH SCHOOL

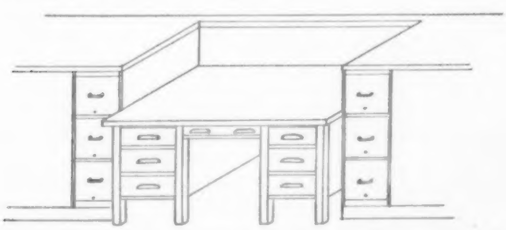
It has been felt by some that the mail box should have been so constructed and located that the clerk could place the mail in the compartments from her side of the counter and the teachers have access to the compartments from the other side.

A telephone is placed on a small table in one corner of the waiting room for the benefit of those who are privileged to use it. This telephone is connected to the switchboard in the office and not directly outside. In this way its use can be controlled.

THE GENERAL OFFICE IN THE WHITE PLAINS HIGH SCHOOL

A Counter Which Might Have Been Better Designed

The counter running the full length of the room is 28 feet long. All the vertical filing cabinets, the storage cabinets and cash drawer are housed in it. This makes for a neat, businesslike office. In planning the counter it was necessary to consider the records and forms that were to be used. Not only the size had to be considered, but also the frequency of use. When this had been determined, the filing drawers and storage cabinets were so located in the counter that those forms, records, and supplies used most frequently would have the most desirable locations. The filing drawers of letter size or larger were equipped with extension slides. A rubber kick plate was placed around the base of the counter for protection and appearance. On the floor along the inside of the counter was placed a carpet runner. The use of the carpet runner over the linoleum floor lessened the physical strain of workers compelled to be on their feet for any length of time, and hence increased their efficiency.



A METHOD OF INCORPORATING A DESK IN A COUNTER

After a year's use it is felt that a desk should have been incorporated into a section of the counter, as shown in the above sketch. The switchboard for the outside telephone and the signal board for the intercommunicating school telephone could be placed on this desk. The secretary in charge of the switchboard would then be able to answer many inquiries of students and visitors without leaving her desk and the telephone switchboard. A desk with a typewriter in one pedestal would be preferable.

Visible Filing Equipment

In addition to the files housed in the steel counter, there are several visible files used for pupil record cards and schedule cards. In setting up any pupil record card, the use of the visible filing equipment should be thoroughly investigated. In a school office the visible filing cabinet should be placed on a stand provided with easy rolling casters so that it may be moved near the secretary's desk for posting, or near the counter for information or reference.

Secretaries' Desks and Chairs

Three desks were provided for the secretaries, one being a drop-head typewriter desk, another a desk with a typewriter in the pedestal, and the third a plain flat-top desk. It is now felt that all the desks should have been 34 x 60-inch flat-top desks having typewriters in the pedestal. This would have enabled the secretaries to type without disturbing any papers that they might have on their desks. The upper drawer in the other pedestal should have a compartment for stationery, and the center drawer should be provided with a pen tray.

The problem of providing the secretary with a chair in which she can be seated properly and comfortably has been given altogether too little consideration. Dr. D. A. Laird[6] and Dr. Henry E. Bennett emphasize the importance of providing the proper type of chair, and the latter states that "a chair will be comfortable for a long time

[6] Laird, Donald A.: "There is a Lot to Just Sitting or Standing."—*Scientific American*, November, 1928, pp. 402-404.

THE PRINCIPAL'S PRIVATE OFFICE IN THE WHITE PLAINS HIGH SCHOOL

only if, when one sits well back in it and relaxes, there is no tendency to slide forward in the seat, to sag at the waist or to fall forward at the shoulders. If one can sit erect while relaxed and remain so without effort, and there is no point or ridge of uncomfortable pressure, the seat will be comfortable."

The secretary's chair as provided in this school would hardly be classed as comfortable according to this definition. In a more recent school office a light, well-constructed swivel chair with easy-running ball-bearing composition casters has been used. It is made of tubular steel with a padded seat and an adjustable padded back. This chair, manufactured by various concerns, is known as a posture chair and would possibly be classified as comfortable by most people.

Principal's and Secretary's Offices

It was felt that all the furniture in the general offices should be of a design that would lend dignity and character, and that this should be especially true of the private office.

The furniture in this office is of American walnut of a pleasing yet dignified design having decoration details such as turned legs, beveled drawer fronts and upholstered chairs. The desk is large, 66 inches long by 37 inches wide. The center drawer is equipped with a pen tray, and the drawers in the pedestals each have two removable partitions. A leather-upholstered swivel chair is provided for the principal, and for those who desire to confer with him there are three leather-upholstered arm chairs. In addition, a table, a waste basket, and a costumer of the same design have been furnished.

Near the desk there is a cabinet which serves as a bookcase and as a cabinet to house the control panel for the centralized radio and public address system. The principal is provided with two telephones, one for communication within the building and the other for outside calls, the latter connected to the switchboard in the general office. The floor of the private office is completely covered with seamless carpet of a neutral color. The windows have drapes of mohair casement cloth of plain weave.

The private office of the secretary is equipped with a desk and a chair similar to those in the main office. In addition, two small tables are provided.

A Library Planned from Unit Requirements

The Baker Memorial Library at Dartmouth College

By JENS FREDRICK LARSON

ARCHITECT, HANOVER, N. H.

THE primary function of a library is to make available the printed or manuscript records of human experience and knowledge. In library planning, therefore, it is necessary to provide for the use and enjoyment of books. This can best be accomplished by first listing the needs which should be met and for which space should be provided in such a building.

Analysis indicates that a college library should include adequate provisions for the following:

1. The storage and service necessary to take care of the book collection. This involves the accession, cataloging, storage and lending of books for outside use.

2. The reading of books and periodicals. Reference material should be accessible for use within the library.

3. Conferences and seminar work with books.

4. Faculty research in the book stacks.

The Baker Library at Dartmouth College, Hanover, N. H., was designed on the basis of these requirements, and a description of their application in this building is given below as an example of the results which have been obtained by directly planning from unit requirements.

Storage and Service

The first need to be met, as outlined, is provision for storage and service. This space is the heart of the library, and the rest of the building must be planned about it.

The main entrance of the Baker library opens directly into the delivery hall, where the main desk is located. A door behind the desk opens into the stacks. This arrangement is important, as a book is taken from the stacks direct to the borrower by authority of the delivery desk.

Library Expansion

It is important to mention at this point that library expansion is primarily a matter of book expansion. The stacks, therefore, should have opportunity for unlimited growth. It is contemplated in this plan to extend a large stack across the back or north end of the stack section of the building, connecting the northeast and northwest wings. This will increase the stack capacity from 500,000 to 2,000,000 volumes and make possible future expansion to whatever capacity is necessary. The present stacks are nine tiers high.

Catalog Accommodations

The card catalog cases, from which the borrower obtains the reference number of a desired volume, are located to the right of the delivery desk in the main hall. The cataloging room, which functions with the card catalog, is immediately behind them. This relationship is necessary, as is also the direct contact between the cataloging room and the stacks. To the left of the cataloging room is the order room, where all new books are accounted for as they are delivered from the receiving room directly below. The layout of these rooms, which use the same stack elevator service, makes for economy of space.

An equal amount of space is provided on the mezzanine floor over the card cataloging and

THE LIBRARY AT DARTMOUTH COLLEGE

is a Georgian structure of red brick with white wood trim in keeping with the New England tradition of the campus

order rooms, to accommodate the growth of the working staff which will be made necessary by future increases in the stack capacity.

Reference Reading Room

The reference reading material was located in the northeast wing of the building in order to be in close contact with the card cataloging room and next to the office of the reference librarian. The room was designed with book alcoves and a gallery containing alcoves for greater book capacity. Two long tables in the center of the room have a seating capacity of approximately twenty-four. In each side alcove on the floor and gallery are provided a table and two chairs. In all corner alcoves are tables seating four.

Periodical Reading Room

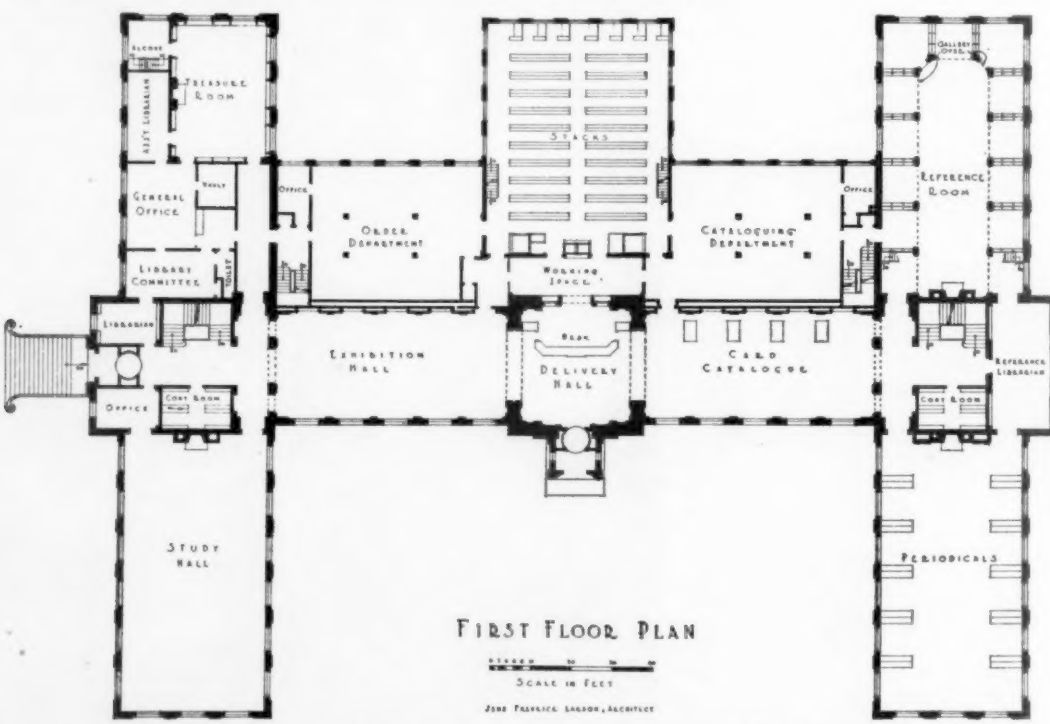
The periodical reading room has alcoves along two sides formed by periodical cases placed at right angles to the outside walls. On the shelves of these cases are displayed technical periodicals of a six months' period. Issues of a thousand different periodicals can be handled. The current popular magazines are placed on five large tables in the center of the room, where they are accessible for reading at all times. At the fireplace end of the room a lounge and two comfortable chairs are placed for browsing. Between the reference and periodical rooms is an office for their administration.

Study Room

The study room is provided to take care of students who find it difficult to study in their dormitories or fraternity houses. It is informally furnished with four large tables accommodating fourteen each, and two round tables with chairs for six each in the center of the room. Around the walls are twelve small tables seating two each. Lounge furniture is installed at the fireplace end of the room, adding to its interest and offering an opportunity for intensive but comfortable study. The room has been kept very simple, the subdued color scheme being its distinctive feature. The rough plaster walls are tinted a warm tan, while the woodwork is a light grayish green.

Treasure Room

The Treasure Room is used to house special valuable books behind bronze grilled doors. It is furnished with comfortable furniture and tables as a memorial room for the use of this material. Exhibition cases have been installed to display valuable manuscripts, autographs and bookplates. In the basement under this room, directly connected by stairway, is the archives room, with book vaults in which to store other valuable books and records.



In the basement plan, not shown, the reserved book delivery hall and reading room occupy all the central space in the front part of the building between the two wings. The two reserved book rooms are in the east wing under the reference and periodical rooms. The receiving room is under the order department, and the west wing contains miscellaneous rooms, including space for the archives and the bindery

The Librarians' Quarters

The librarian's and assistant librarian's offices are en suite with the Treasure Room, and directly opposite the door to the service portion of the library. The librarian's quarters consist of a general office, a private office, and a committee room, with a toilet for this group.

Reserve-Book Reading Rooms in Basement

In the reserve-book reading rooms are kept books in which classes have been given special assignments; these books students may borrow for short periods only. The reading rooms are in the basement and have a separate outside entrance independent of the rest of the library. The reserve delivery desk is located under the main delivery desk, and has the use of the booklift and elevator in common with the main desk.

Behind the basement delivery desk are separate stacks for the stacking of books for immediate use. Otherwise, the only equipment and furnishings are tables and chairs for the number of students requiring the use of these rooms.

Lounge Reading Room

On the second floor over the delivery hall is a large room divided into three units. Here has been created a place for browsing in literature, in character with the reading room of a large club, with fireplaces, alcoves, and comfortable furniture. The walls are oak paneled, with a gallery over the alcoves. The rough-cast plaster walls above the woodwork are a warm harmonious tone. The ceiling above the light-finished wood beams is sky blue.

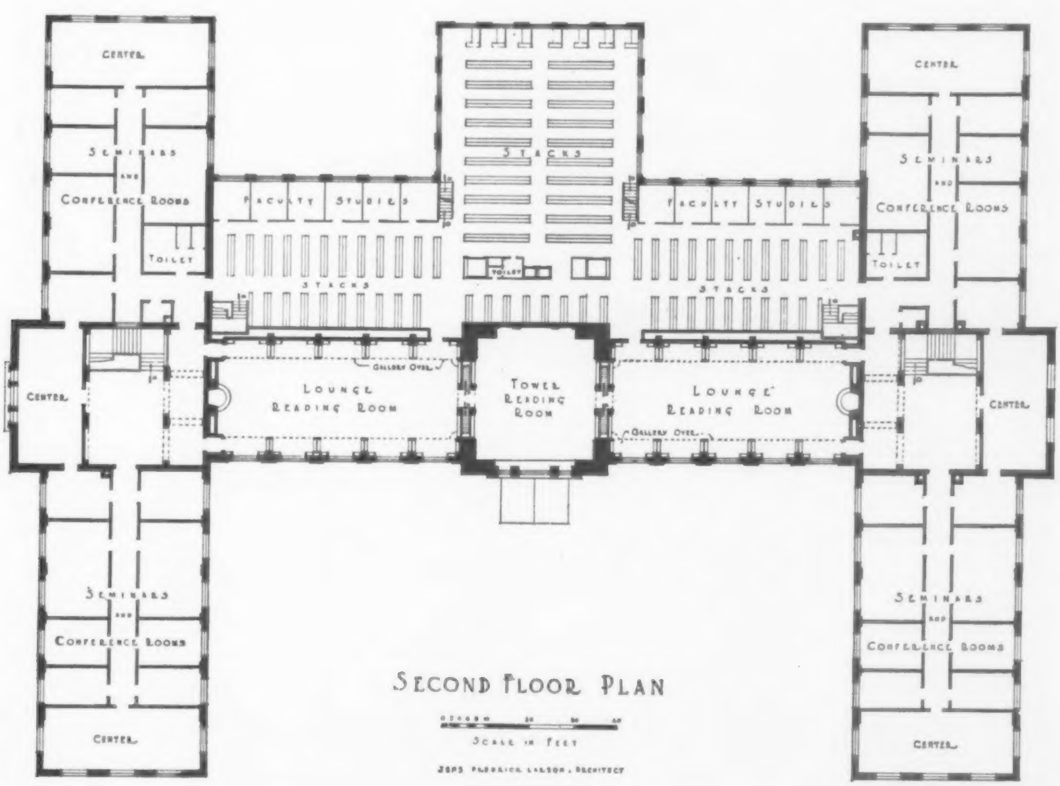
Each alcove is devoted to books of special interest, and the more popular type to tempt the students to read in fields other than those in which they are majoring in their college courses. The custodian is an interpreter of books and aids the students in their digressions.

The most interesting feature of the lounge, architecturally, is the entrance through doors under the gallery. The object of these is to make the room the end of a journey, and the small doors also serve to make it much quieter. Fireplaces are located at both ends where normally large monumental entrances would have been installed. With entrances of this type the room would have become a hallway and entirely lost its chief function.

The lounge reading room is used extensively by the students and faculty, thereby serving its purpose and proving a very worthwhile investment for the college.

Conference and Seminar Rooms

To use the library for conferences and seminar work it was necessary to bring the faculty and



SECOND FLOOR PLAN

students together for conferences with books under the most satisfactory conditions. Since the college works on a departmental basis, it was found advisable to provide departmental "centers," with books pertinent to their courses. The seminar rooms are for groups of not more than fifteen, while the smaller conference rooms are for units of not more than eight students. These rooms are all carefully scheduled for time and use.

Stack Reading

The stacks, in addition to the storage of books, are also used for book reading. They are open to the student body, and tables have been provided at all side windows for reading. The stacks were carefully planned to have good natural light. At the north or back end of each stack level, carrels with tables and cases have also been provided for the closer use of books.

Faculty Research

Provision for faculty research and for creative work where the source of inspiration is books, has been taken care of by creating small rooms eight feet square opening off the upper three levels of the main stacks. These are allotted to faculty members each semester, and an attempt is made to place them as near as possible to the books which the individuals wish to use. The rooms have no telephones or other means of interruption, and are very carefully planned for isolation in order to obtain the quietness of seclusion. A locked door from the stacks leads into a corridor from which these rooms open. There are fifty-three rooms and they are always in demand.

Miscellaneous Rooms

Miscellaneous rooms in the library include a women's lounge and a rest room with shower bath and toilets, and general toilets and coat rooms for public use.

Courtesy of Snead & Co.

ONE OF THE THREE UNITS OF THE LOUNGE READING ROOM

Newspaper stacks are available for filing back numbers of newsprint. The plans anticipate a bindery, but as yet the need has not been sufficient to develop a bindery department inside the library. In the map room maps may be hung on the walls for study and research in various subjects.

The building also has a photostat room where a great deal of work is done on books and other material outside of the library use. The work is done on a basis which makes this department pay

THE PERIODICAL ROOM

Courtesy of Snead & Co.

THE STACKS

for itself. A room has been provided for statistical machines, though the need for this has not as yet developed.

A Background of Beauty

The Baker Memorial Library now serves a student body of 2,200 and a faculty of some 280 members. The stacks at present hold approximately 307,000 volumes. Located in the center of the campus, the library exemplifies the idea that beautiful surroundings are an incentive to education.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Acoustical Treatment—The Celotex Co.
Cleaning Equipment—The Spencer Turbine Co.
Clocks and Signal Systems—The Standard Electric Time Co.
Doors, Flush—Roddis Lumber & Veneer Co.
Drinking Fountains, Plumbing Fixtures, and Sanitary Equipment—The Crane Co.
Fire Alarms and Fire-Fighting Equipment—Wirt & Knox Co.
Flooring, Cork—United States Cork Co.
Flooring, Linoleum—John H. Pray & Sons
Flooring, Rubber Tile—Goodyear Tire & Rubber Co.
Heat Regulating System—Johnson Thermostatic Control Co.
Library and Office Equipment—Yawman & Erbe Co.
Library Stacks—Snead & Co.
Lighting Globes and Fixtures—The Holophane Co.
Piping—American Brass Co.; Central Foundry Co.
Roofing—The Barrett Co.
Steel Windows and Sash—Truscon Steel Co.
Window Louvre Controls—Lord & Burnham Co.
Builders—Hegeman-Harris Co., Inc.

The Installation of Sound-Picture Equipment in Educational Buildings

BY V. C. ARNSPIGER

DIRECTOR OF RESEARCH, ELECTRICAL RESEARCH PRODUCTS, INC., NEW YORK

EVERY school contemplating the installation of sound-picture equipment should consult at an early stage either a reliable manufacturer of such equipment or an engineer specializing in this kind of work. This should be done before engaging in any detailed or extensive structural planning, either for new buildings or for alterations to existing structures, and, above all, before making any expenditures for actual construction. Such a procedure is by far the most economical and satisfactory, as it insures the availability of proper information regarding space requirements, wiring facilities, acoustic conditions, etc. A discussion like the following can only indicate some of the considerations which enter into the planning of sound-picture installations.

Sound-picture equipment for educational purposes may be obtained either in a mobile form which makes it possible to move the projectors, screen, etc., from place to place, as, for example, to different classrooms; or in a form designed for permanent installation in one place, normally the auditorium. Installations of the permanent type are usually the largest, and afford the most complete picture of installation problems; this article will therefore be primarily concerned with them. The points brought out regarding each installation feature will apply equally well to the smaller and simpler projects which include that particular feature.

Small Classrooms

The only structural requirement for the operation of sound pictures in small classrooms is a power-supply outlet. No special acoustic treatment is necessary, as acceptable results may be obtained in the ordinary room. In a classroom or an auditorium the horns are placed behind the screen in order to obtain the illusion that the sound is emanating from the source depicted on the screen. It is worth noting in this connection that screens of a special type are available, having such acoustic properties that they transmit sound from the horns to the auditorium freely and without appreciable distortion, at the same time producing a picture of unusual brightness and clearness. The use of these screens also avoids the risk of eye-strain, and minimizes normal visual fatigue.

The utility of a sound-picture installation can often be considerably increased by providing what is called non-synchronous equipment—that is, a pair of turntables on which phonograph records of the ordinary type can be played, the sound being reproduced through the same amplifier and horns used for sound pictures. A large variety of records specially prepared or suitable for such use is now obtainable. Public address equipment, for reënforcing the voices of speakers in an auditorium, or for transmitting speech or music to other parts of the building, can also be used in conjunction with sound-picture equipment.

Perhaps the most logical method of approaching the subject of educational sound-picture installation is to consider its various aspects in the following order, according to their place in the normal sequence of building planning:

1. Fundamental space and structural requirements
2. Wiring facilities
3. Acoustical considerations

The Size and Shape of Auditoriums

When an installation is to be made in an existing building, it is usually not practicable to consider changing the auditorium dimensions, so they

do not form a controllable factor in the problem. In the case of new construction, however, the size of the auditorium must be considered. Its dimensions will usually depend primarily on the size of the gathering to be accommodated, and whether all the audience is to be seated on one floor or whether there is to be a balcony. From both the visual and the acoustical standpoint, it is desirable that a sound-picture auditorium be neither unduly long and narrow nor very shallow and wide. "Long" and "shallow" refer to the distance from the stage to the rear. The best results are probably obtained when the depth is somewhat greater than the width, but is not more than one and one-half times the width. If the width of an auditorium materially exceeds the depth, many spectators must view the screen obliquely, and the use of additional horns may also be required to obtain proper sound distribution. On the other hand, in a long, narrow auditorium, conditions for observing and listening at the rear are likely to be much poorer than if the auditorium were shallower and wider.

The shape of the auditorium is not a very critical factor provided the foregoing desiderata are complied with. From an acoustical standpoint, the conventional fan-shaped theater-type auditorium is ordinarily acceptable, while a plain rectangular auditorium with more or less flat walls and ceiling usually can be improved upon by the judicious application of sound-absorbing material. In any rectangular auditorium, however, the angle of vision from the seats in the two front corners will be too oblique to make these seats desirable, so that usually this space can be walled in or used for other purposes, such as an organ loft. Curved rear walls and domes in the ceiling are features which may cause serious acoustical difficulty unless carefully handled under competent guidance.

The Screen

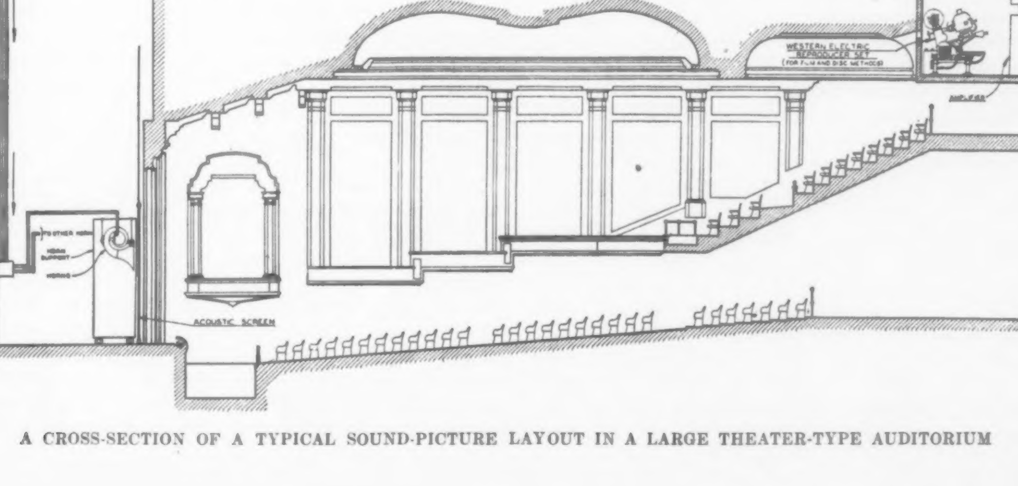
The screen must be large enough to allow adequate perception of detail by the spectators farthest removed, and at the same time the front row of spectators must be far enough from the screen so that the image does not seem distorted. Very high balconies are objectionable because the screen image is likely to be foreshortened, and also because it may be necessary to project the picture at such a steep angle that distortion will result.

In some cases, the stage on which the screen is mounted may be a simple raised platform, with the screen the only structure on it In other cases, there may be a complete set of stage scenery approximating that found in regular theaters. The screen may remain permanently in place, it may be removable, or arrangements may be made to fly it like a drop.

For large auditoriums, it is desirable to have a clear space of not less than 7 feet between the screen and the rear wall or the next drop to allow for proper adjustment of the horn positions and for their inspection. If conditions are somewhat cramped, however, a shallower type of horn requiring only from 3 to 4 feet may be employed. In the smallest auditoriums, and in classrooms, the type of horn generally employed requires only 3 feet of space behind the screen. Depending on the size of the room or hall, the horn may be mounted on a portable tower, a stationary scaffold, a monorail trolley or a stage elevator, or it may simply be hung from the ceiling or stage grids. In the case of mobile equipment, it can be mounted on the same supporting base as the screen.

The Projection Room

With mobile projection equipment, the question of a projection room does not usually arise



A CROSS-SECTION OF A TYPICAL SOUND-PICTURE LAYOUT IN A LARGE THEATER-TYPE AUDITORIUM

if safety film is used. With permanently installed projection equipment and the use of safety base film, a projection room, while not absolutely necessary, is extremely desirable, both for isolating machine noise and because there will be less likelihood of distracting the pupils' attention. If a school desires not to be restricted to the use of safety film, a projection room is of course essential.

If the projection machines and sound reproduction and amplifying equipment are to be enclosed, there should be a proper projection room or booth, carefully designed and constructed. This room houses apparatus which constitutes the heart of the whole sound-picture system, and provides working space and facilities for the personnel whose efficiency forms a vital link in the success of each program. The value of an expensive auditorium may be seriously diminished, so far as sound pictures are concerned, by a poor projection room. It is therefore no exaggeration to say that from the planning standpoint this room is just as important as the auditorium and should receive equal consideration.

If the projection booth is located at so great an elevation above the screen as to cause distortion in the projection of the picture, the distortion can be partly compensated for by tilting the screen backwards. Such makeshifts should, of course, be avoided in good building design. The projection angle, that is, the angle between the horizontal and a line drawn from the projection lens to the center of the screen, should, for this reason, not exceed 25 degrees.

The Size of the Booth

It is essential that the projection booth be large enough to include the equipment and still provide adequate working space. In the discussion that follows, the dimensions given are working limits; local city or state ordinances may require greater allowances. In the case of installations in existing buildings, if enough space is not available, it will be necessary to make whatever structural changes are required to provide it. Manufacturers of sound-picture equipment are glad to furnish recommendations in such cases if supplied with a floor plan of the booth, together with a sketch of the front and rear walls.

Generally speaking, projectors should be spaced 5 feet between centers, with 3 feet between the center line of each projector and the side wall of the booth. For a booth to accommodate two projectors, a frontage of 11 feet is required; that is, this will be the length of the booth parallel to the screen. If there is also a spotlight, slide projector or other additional equipment, 5 feet should be added to this dimension for each piece of equipment.

The depth of the booth from front to rear should be 10 feet. A space 3 feet wide should be available on either the rear or the side wall for mounting the amplifier equipment. At the right of the left projector lookout-port, space for mounting the fader should be provided—a space approximately 30 inches high by 12 inches wide at a height of 5 to 6 feet. The height of the projection port should be 5 feet, and that of the projection room should be not less than 7 feet. The floor should be of rigid construction, so that there will be no appreciable vibration. Each complete sound-picture projection machine may weigh up to 1,500 pounds, depending on the type. The booth walls must be strong enough to support a weight of at least 400 pounds.

The Importance of Ventilation

The great amount of heat produced by the projector lamps may result in very trying working conditions in the projector booth during hot weather if adequate ventilation is not provided. And if the booth becomes very cold in winter, not only is this an unfavorable working condition, but it may also cause mechanical difficulties by stiffening the oil in the bearings of the projection and sound-reproducing mechanisms. It is therefore of prime importance that the booth be thoroughly ventilated and adequately heated. If possible, forced ventilation should be employed with both inlet and outlet ducts. Good ventilation is also required for the non-synchronous equipment room, if provided, and for the battery or motor-generator room.

Additional Rooms

For the battery or motor-generator equipment there will be required an additional room, not less than 6 feet long by 4 feet wide by 7 feet high, within 30 feet of the projection room. If non-synchronous equipment is to be installed, another separate room should be provided, 6 feet long by 4 feet 6 inches wide by 7 feet high. It must have a window through which the operator can obtain a good view of the stage and auditorium. If notable savings in expense or gains in convenience would result from reducing some of the foregoing recommended dimensions, it may be possible to do so without seriously affecting the proper operation of the machines, but such changes should never be made without consulting the suppliers of the sound equipment.

Wiring Facilities

It is well known that the installation of additional electrical circuits after the construction of a building has passed a certain stage, costs much more than if the circuits had been installed when the rest of the wiring was done. Furthermore, the job will not be so satisfactory from a mechanical and appearance standpoint, as it will often not be feasible to run concealed conduits and the conduit must therefore be placed on the surface of the walls and ceiling. This indicates the desirability of consulting the supplier of the sound-

SCENES FROM FOUR TALKING PICTURES

"Fundamentals of Football" was produced by the Department of Educational Talking Pictures of the Electrical Research Products, Inc. The scene at the upper right is from "Classroom Demonstrations—Grade 1 and Grade 6," taken in the Bronxville Public Schools, Bronxville, N. Y. "The Study of Infant Behavior" was produced with the cooperation of Dr. Arnold Gesell, head of the Yale University Psycho-Clinic. The last view is from "Woodwinds," part of the Symphony Orchestra Series

picture equipment before the wiring of the building is finally planned.

When a decision has been reached as to the equipment to be installed, the dealer can furnish detailed and exact information as to the wiring facilities required. The following discussion is intended only to illustrate in a general way the kind of facilities needed for typical installations. The information should not be taken as a basis for anything more than tentative plans. Suppliers of equipment naturally cannot assume any responsibility for the application of such information to a particular project without their specific approval.

The Power Requirements

One hundred and ten volt, 50 or 60 cycle, single phase alternating current is needed for the operation of sound-picture equipment. If considerable fluctuations of voltage or frequency occur during working hours, it will not be practicable to run the equipment directly from the power supply. In this case, or if the supply is direct current, special conversion equipment will be required. While the total power load imposed by the sound system is not great, the wiring should provide for 60 amperes (6.6 kva.) in order to prevent voltage variations when power for one of the units is turned on or off. This load is in addition to that represented by the projection lamps, booth lights, etc. Separately fused AC power outlets of 15-ampere capacity each are required as follows:

1. In the booth, at each projector position.
2. In the booth, at the amplifier location.
3. In the motor-generator or battery room.
4. In the non-synchronous room (if such equipment is included).

Batteries or a motor-generator are required to furnish a low-voltage DC supply for such purposes as lighting the exciting lamp in the reproducing machines, the pilot lights and indicating lights of the equipment, etc. The motor used in this set is approximately 1½ hp. If the power

company will not permit a motor of this size to operate on the 110-volt current, on a three-wire system, a transformer of at least 3-kva. capacity must be supplied for stepping-down the 220-volt supply to 110 volts. On three-phase systems, a three-phase motor can be used.

The Horn Circuits

A distribution box for the horn circuits should be mounted on the rear or side wall of the stage. Two or three 4-conductor cables, furnished by the supplier of the equipment, should be used to connect this box with the receivers associated with the horn or horns. It will be necessary to install in each cable, at the horn support, a 4-conductor plug; this is also furnished by the dealer. If public address equipment is to be installed or if it is desired to have speech or music transmitted to other points from the auditorium, additional wiring must of course be provided.

Good Acoustic Conditions Essential

In every type of gathering-place, no matter what its size, good sound reproduction depends as much upon proper acoustic conditions as upon the correct design and functioning of the reproducing equipment.

Among the usual defects of auditoriums are excessive reverberation, echo, interference, non-uniform distribution, the transmission of external noises, and the presence of internal noises from mechanical sources. Excessive reverberation means a prolongation of sound resulting in confusion caused by the overlapping of syllables. Echo means a definite repetition of a sound, causing a word or syllable to be clearly repeated. Interference is a meeting of direct and reflected sound waves in such a manner that certain sounds are distorted or their character considerably altered. This effect also results in non-uniform distribution, causing areas of high and low volume.

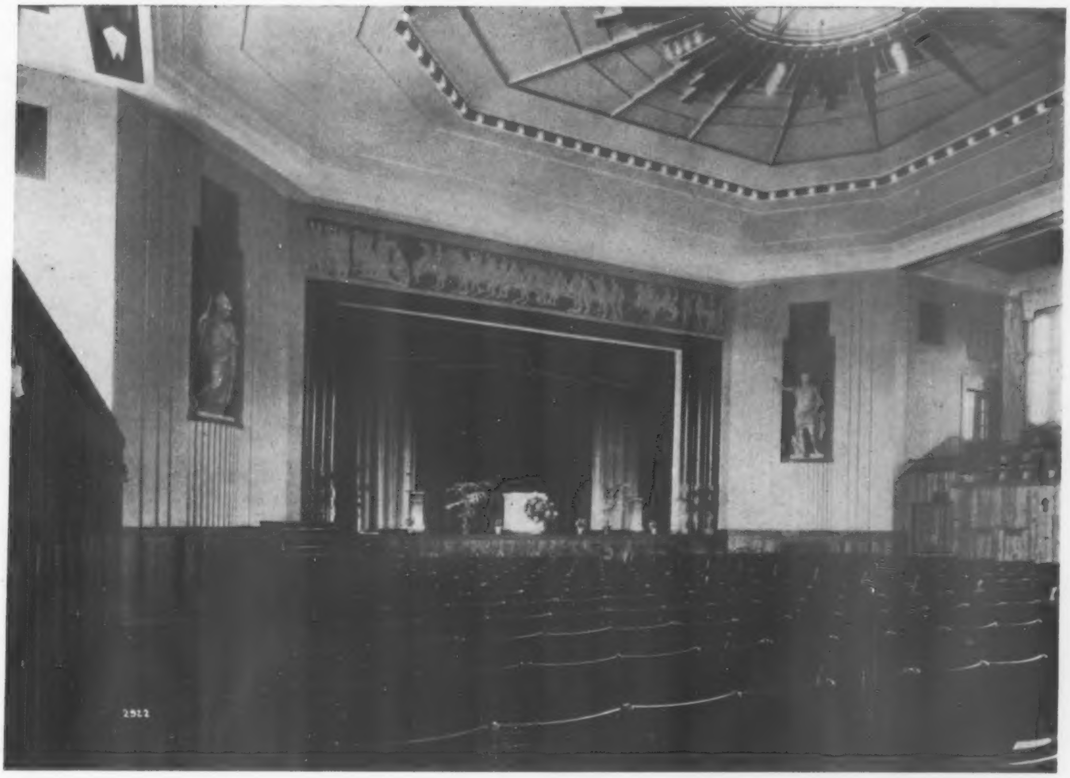
To Obtain Good Acoustics

Excellent acoustic conditions require uniform distribution of sound energy throughout the auditorium, and a rapid dying-out of a sound to make way for the one succeeding it. Some reverberation is of course desirable, otherwise the room would appear to be "dead." While the limits within which reverberation time may lie and still produce acceptable conditions are rather wide, there is nevertheless a very strictly defined optimum value for each size of auditorium. The closer this value is approached, the better will be the conditions.

Careful consideration and analysis of the proposed auditorium before construction may reveal certain surfaces which, if slightly altered, would eliminate defects of a serious nature. The effects produced by the curvature of wall and ceiling surfaces are examples of this. Likewise, the proper installation of carefully selected sound-absorbing material during construction will, in every instance, prove more economical than waiting until the construction has been completed and the defects noted.

The Reduction of Noise

The problem of noise reduction is also a vital factor today, especially since the introduction of silently recorded pictures. The presence of interfering noises tends to mask or cover up the low-intensity sounds which are so necessary in creating the effect that the director wishes to achieve. External noises, such as those caused by railways and traffic in the vicinity of the auditorium, must be guarded against in the building structure itself, so as to prevent their introduction by transmission through the floors and walls. Internal noises may arise from several sources, prominent among which are often the motion-picture projectors and the ventilating and heating system. While noises of this kind may be more readily corrected, they should nevertheless be considered when selecting mechanical devices. There are available, for example, numerous auditorium and theater ventilating systems which have been designed to reduce noise to a minimum. Expert unbiased advice in the selection of mechanical devices, as well as in methods of soundproofing buildings, will prove an economical item in the building program.



THE AUDITORIUM OF THE WOBURN HIGH SCHOOL, WOBURN, MASS.

A High School Auditorium for School and Community Use

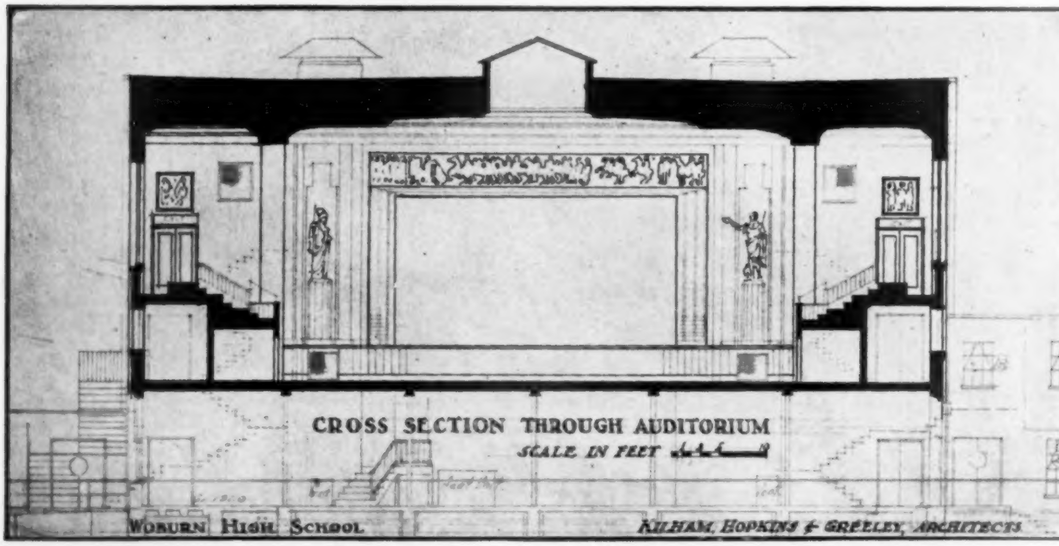
BY WILLIAM ROGER GREELEY
ARCHITECT, BOSTON, MASS.

THE architecture of the modern school is kept in a state of rapid change by the development of new school needs. No sooner does one type of building come into use, meeting the requirements of a given community, than the requirements themselves change. As a result, when a few years later an addition is made to the same building, the new arrangement of rooms, stairways, halls or other elements of the design may be conspicuously and sometimes even radically different from the plan of the older structure.

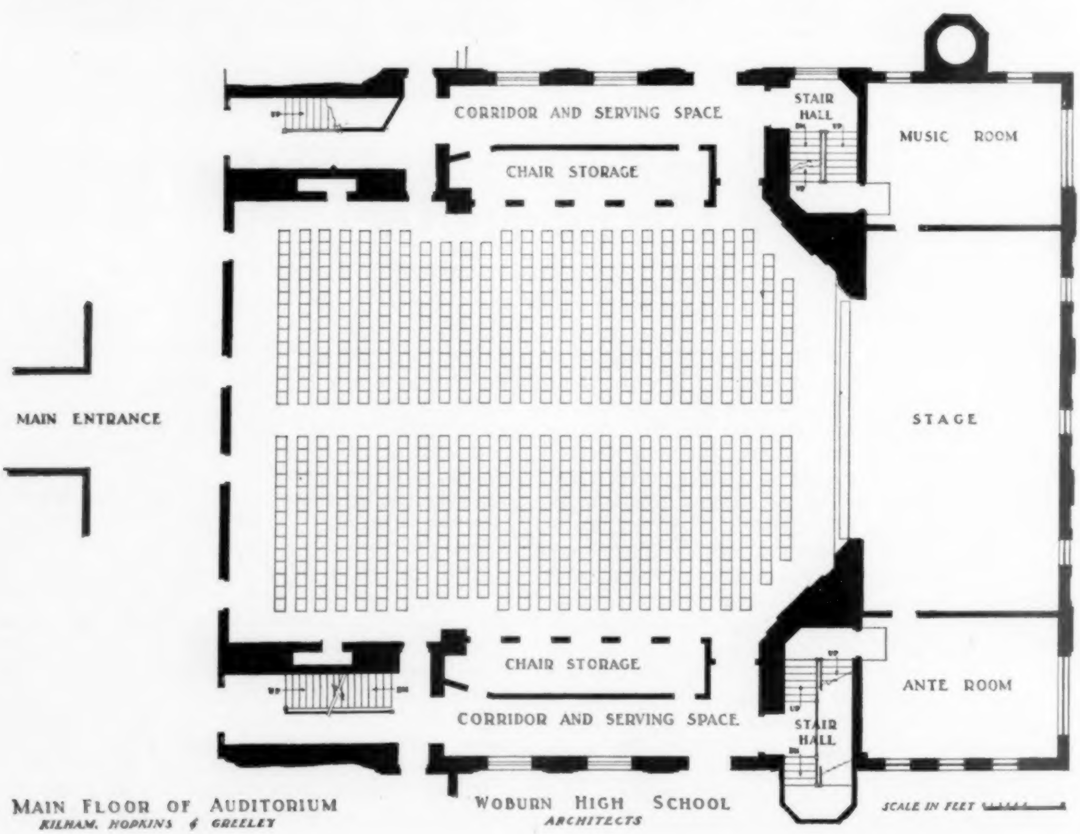
Assembly hall requirements are no exception in the general tendency to evolve new forms. In the High School at Woburn, Mass., built about fifteen years ago, the assembly hall, according to approved practice at the time, was placed on the top floor in the middle of the building where the long supports over the room were required to hold only a roof load. Today, additions have just been completed enlarging the original building to several times its former capacity, converting the old assembly hall into laboratories, and adding a new assembly hall at the first floor level.

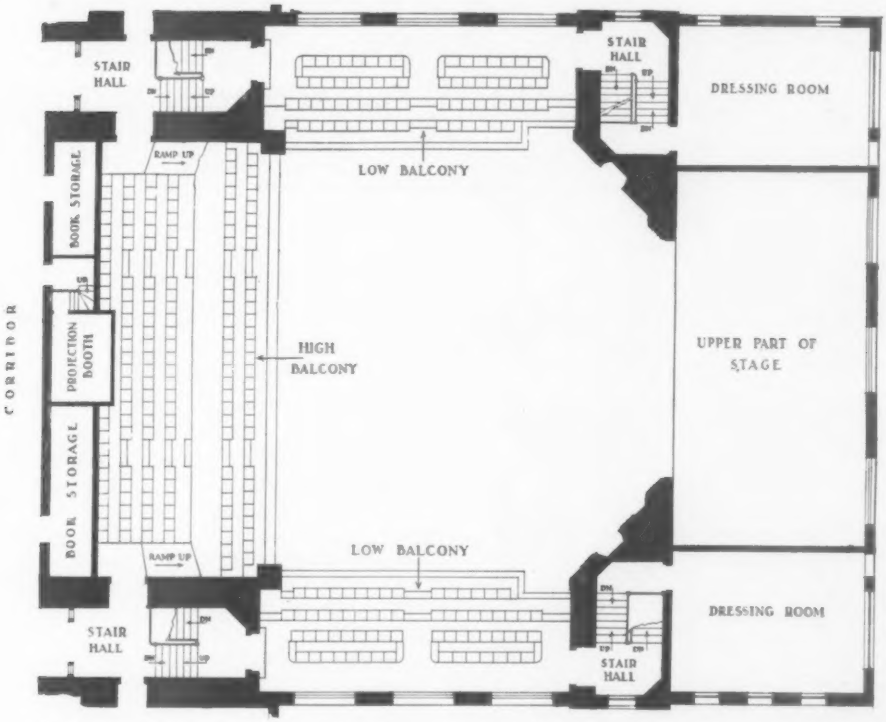
The requirements for this new hall, in addition to arrangements for the seating of a thousand people, included: provision for theatricals of an elaborate nature, involving complex stage equipment; acoustics suitable for concerts; a level floor from which the assembly hall seats can be speedily cleared for the dancing that may follow an entertainment or lecture; provision for serving quickly and easily either light refreshments or a banquet; the proper placing of balconies to permit an easy view of the entire floor area by spectators watching dancing or games or Scout work; sight lines for the best display of moving pictures; and proper space for an orchestra on the floor during plays and other stage performances.

These conditions have made necessary the development of a somewhat novel type of room,



which is shown in the plans and sections presented herewith. It is especially noteworthy for the arrangement of side balconies at a level so near that of the main floor that they resemble the bleachers of a stadium and afford ample view of whatever is occurring on the floor. It has been found by actual experience that these balcony seats are very practical and are often used in preference to those on the floor itself. It is also possible to speak from the balconies and to be seen and heard in all parts of the auditorium, thus making the room of practical use for such





BALCONY PLAN OF AUDITORIUM WOBURN HIGH SCHOOL
KILHAM, HOPKINS & GREELEY ARCHITECTS

gatherings as discussion meetings in which members of the audience participate.

The height of the balconies is sufficient to provide a series of cupboards into which the assembly hall chairs may be pushed quickly and easily from the main floor with a minimum of noise and labor, and therefore with a minimum of injury to the chairs themselves. This storage space is concealed by doors, so that the front of the balconies resembles a paneled dado. The space at the rear under the balconies is utilized by corridors and serving rooms, which facilitate the serving of refreshments in connection with dances and other social gatherings in the hall.

The relation between the number of seats on the main floor and the number of seats in the balcony is always a serious question. The more nearly these two numbers equal each other, the more economical the hall is likely to be in total cost, but the deeper the balcony, the more difficult it is to secure proper ventilation, and, even more important, proper acoustical results on the main floor under the rear of the balcony. This difficulty is entirely removed by side balconies, and the rear balcony is kept sufficiently shallow so that no trouble is experienced in hearing underneath.

The stage, in order to meet the requirements for choruses, graduating classes and high-school orchestras, must have a floor area so large that it looks entirely out of proportion in the case of ordinary lectures or small stage gatherings. It is therefore provided with a cyclorama curtain to give an apparently reduced size in the latter cases. Provisions have been made for the use of radio.

A stairhall near the entrance to the auditorium leads to coat rooms, and toilets directly underneath, for use by the public after school hours. A hall of this size is now regarded as scarcely paying for itself unless it can be used frequently in the evenings as well as during the school day. It is therefore wise to plan it in such a way that the rest of the school building can be kept under lock and key in the evening, with the public admitted directly to the auditorium, coat rooms and ante-rooms.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Acoustical Treatment—Celotex Co.
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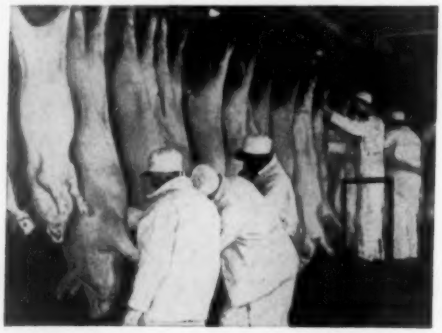

SCENE FROM "MEAT PACKING"

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Electric Power in the Southern Appalachians
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Maple Syrup and Sugar
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Mexico
The Mining and Smelting of Copper
The Mohawk Valley
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Chemical Effects of Electricity
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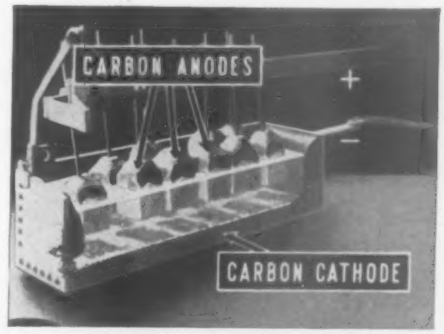
Write for full information and literature.

SCENE FROM "CENTRAL AMERICA"



ANIMATION FROM "CHEMICAL EFFECTS OF ELECTRICITY"

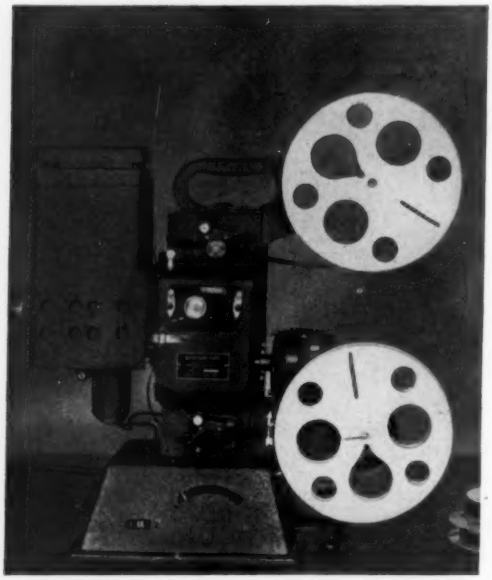
SCENE FROM "ROCKY MOUNTAIN MAMMALS"

SCENE FROM "RANGE SHEEP"

EASTMAN KODAK COMPANY

Rochester, New York

MOTION PICTURE EQUIPMENT
For Use In School Or Home



KODASCOPE, MODEL A

The Kodascope, Model A, not only meets the requirements for a classroom projector but offers exclusive features that have won the approval of school authorities everywhere.

Anyone can operate the Kodascope . . . threading is quick and easy. Direct illumination is furnished by a 250-watt lamp. At 23 feet from the screen, Kodascope, Model A, throws a brilliant image measuring 39 by 52 inches. Equipped with 5-inch lens, a picture the same size may be shown at 57½ feet. List price with 1-inch or 2-inch lens, $180. Other models of Kodascopes at $60, $275 and $300.

CINÉ-KODAK, MODEL K

The Ciné-Kodak, known the world over as the simplest of home movie cameras, is available in two models. Model K (illustrated below) is equipped with either the f.3.5 or the f.1.9 lens. Lenses are interchangeable with each other or with the f.4.5 long-focus lens. With the f.1.9 lens, Kodacolor (full, natural color) pictures are made with this camera. Finished in gray, black, blue and brown genuine leather with case to match. Price with f.3.5 lens, $110; with f.1.9 lens, $150.

Ciné-Kodak, Model M, is equipped with a permanently attached f.3.5 lens only. No focusing is required. Portrait attachment is supplied with camera. Price, $75, case included.

RCA PHOTOPHONE, INC.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

411 Fifth Avenue, New York City

BRANCHES ALL PRINCIPAL CITIES

VISUAL EDUCATION TURNS TO THE TALKING PICTURE

Leading Educators, convinced of the great force of the sound motion picture as an entertainment medium, have for the past year become more and more interested in its potentialities with regard to visual education. Already many of the modern institutions of learning have converted their obsolete silent motion picture apparatus and are employing sound reproducing equipment in their class rooms with great success. It is expected before another year passes, that practically every educational institution of importance in the country, including colleges, universities, academies, high and public schools will install sound reproducing equipment in their assembly rooms.

During 1930, R C A Photophone, Inc., established an unparalleled record for installation of sound apparatus. In addition to having installed equipment in upwards of 2,000 theatres, 81 U. S. Army Posts and numerous other non-theatrical institutions, the largest single contract ever awarded, providing for the installation of 300 units of equipment upon the battleships and in the shore stations of the U. S. Navy throughout the world was awarded to R C A Photophone, Inc. The Teachers' State College at Cedar Falls, Iowa; Lake Seminary, Mundelein, Illinois, and the Warren Harding High School, Bridgeport, Connecticut, were among the educational institutions to install Photophone equipment.

R C A Photophone sound-reproducing apparatus for use in educational work accommodates standard-size motion picture film and reproduces any standard sound-on-film motion picture. Types of apparatus manufactured for both permanent and portable installations, depending upon the requirements of the institution.

RCA VICTOR COMPANY, INC.

ENGINEERING PRODUCTS DIVISION

Camden, New Jersey

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New York, N. Y.
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Centralized Radio System

San Francisco, Calif.
235 Montgomery Street

RCA CENTRALIZED RADIO
A Big Success in Modern Schools

A Central Receiving Apparatus Brings a Variety of Programs to Every Classroom

School authorities and architects are enthusiastically installing RCA Centralized Radio Systems in the schools of America.

They have found it of tremendous aid in holding the interest of students.

RCA Centralized Radio is extremely simple, economical; prevents future wiring costs, and avoids unsightly individual antennae and lead-in connections.

The operation of RCA Centralized Radio Equipment is very simple. The incoming program is distributed to any desired parts of the building through the distribution board located on this panel

Every part of the RCA Centralized Radio System; every unit; every piece of apparatus has been painstakingly planned to assure absolutely satisfactory operation.

Briefly, the equipment consists of radio receiving apparatus, power devices for supplying and controlling the various voltages from the lighting current, powerful amplifying apparatus and a control panel or switchboard that makes it possible to send the incoming programs to any or all parts of the building.

One receiver with its amplifying equipment, distribution and outlet equipment constitutes one "channel." One channel is required for the reception of one program. Provision can be made for as many as four channels in order that each classroom may choose any one of four programs. Announcements may be made over the entire system or to any desired points on the system by means of a conveniently located microphone.

The distribution is so arranged as to render the most reliable service with a minimum of attention on the part of the operator. No batteries or charging are necessary as the apparatus is built for lighting circuit operation.

Each classroom has its own RCA Loudspeaker enclosed in a metal box and built into the wall. This loudspeaker, neat and unobtrusive, has the volume control and channel selector mounted on immediately beneath the speaker opening. When the loudspeaker is installed above reach, these controls are located at a height suitable for easy adjustment.

A typical RCA Loudspeaker for Centralized Equipment. One of these is built into the wall in each classroom

By merely turning the volume control, it is possible to either decrease or increase the volume of the incoming program. By adjusting the station selector knob, choice of programs is provided in systems employing two or more channels.

A special phonograph unit with magnetic pick-up and induction disc motor-driven turn-table for records can be included in the installation if desired. The unit is self-contained, portable, and can be used attached to the central control panel or to the wall, or may be located upon a convenient table.

Further details and information may be obtained by writing to the nearest RCA Victor district office.

The RCA Auditorium Radiola-Phonograph Combination

The RCA Auditorium Radiola-Phonograph is becoming a musical and educational necessity to the modern school or institution. It is a super-powerful combination of the most modern radio and phonograph and reproduces tones with a fidelity absolutely astounding.

Progressive schools have already taken advantage of the wealth of musical material, invaluable to musical study and appreciation, which radio today makes available, but they have been hampered until now by the lack of a reproducing instrument which could satisfactorily be heard by a body of listeners in a large hall. No radio instrument of ordinary home type is satisfactory for that purpose, and therefore the RCA Auditorium Radiola-Phonograph Combination was designed.

The RCA Auditorium Radiola-Phonograph employs the finest RCA Super-Heterodyne receiver, combined with the latest type electrical phonograph. The Super-Heterodyne Circuit assures the highest degree of sensitivity and selectivity, and the multiple loudspeaker unit — embodying three RCA 8-inch electro-dynamic speakers mounted on a baffle at angles of 15 degrees —produces volume that is ample and yet perfectly controlled, non-directional projection, and undistorted quality throughout the musical scale.

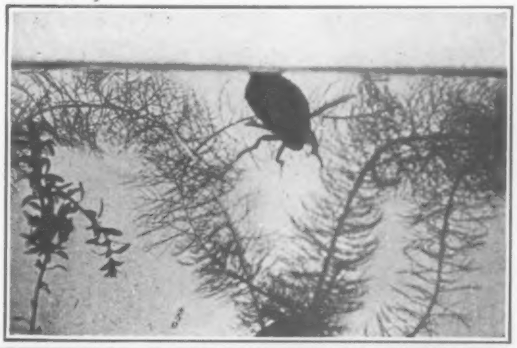
The control cabinet is of the console type and includes both the radio receiver and the phonograph, with all necessary controls.

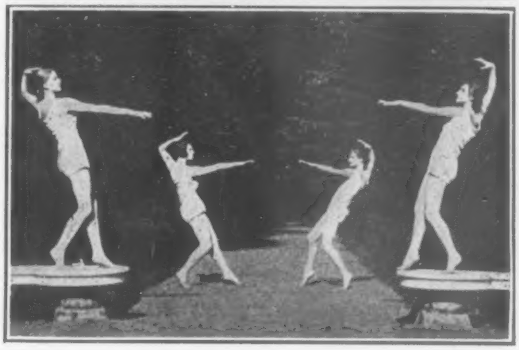
The loudspeaker mounting will harmonize with the furnishings of any room where it is likely to be employed. It is finished in antique ivory; the loudspeaker opening is covered by a screen whose fine mesh is the color of old gold.

Complete details will be sent to school authorities upon request. Please address the nearest office of the RCA Victor Company, Inc., stating the form of lighting current available in your buildings.

SILENT (with Classroom Titles)

2. Winged Death
4. A Fair Exchange
5. Our Domestic Fowl
6. The Lives of Amphibians
10. The Silver Swimmer
19. Treacherous Waters
24. Life in Tanganyika
25. Underwater Households
26. Submarine Camouflage
29. Secrets of the Sea
30. Marvels of the Deep
33. The Monarch of the Glen
34. Poisonous Fangs
36. Feathered Pests
37. Remnants of the Past
38. Under the Microscope
40. Friends of the Hunters
42. Pets of Mankind
43. Velvet Paddies
44. Assorted Babies
45. Countless Enemies
46. Instinct of Parenthood
47. Mothers and Mothers
52. Tally-Ho!
54. Venice
56. When School is Over
57. The Snake's Life
58. A Visit to Mother Nature
59. Malayan Ceremonials
62. Switzerland, Customs
65. Switzerland, Mountain Roads
68. Switzerland, Playground of the World
70. Switzerland, Railways and Tunnels
75. Sleeping Death
77. Birds of the Beach
78. Tokens of Manhood
80. Primitive Housekeeping
82. Amazon Hazards
83. Abyssinia, Manners and Customs
84. A Persian Wedding
86. Motoring in the East
87. Sacred Baboons
92. Abyssinia
93. Bits of Africa
98. Silken Cocoons
99. Survival of the Fittest
102. The Hedgehog
103. Entering Womanhood
105. A Rush for Diamonds
106. Amazing Animal Habits
108. African Elephants
112. Inroads of Insects
117. The Blood
119. An Ancient Art
120. A Raft of Goatskins
124. The Polecat
126. Preparation for Winter
127. Roumania, Peasant Life
130. Motherlove Among Lower Animals
132. Life in a Pond
134. Roumania, Oilfields
136. Nesting Habits
140. A School for Birdmen
141. The Cycle of Life
142. The Common Rat
143. Mysterious Forces
144. The Spreewald
145. Holland
147. Iceland
148. Egypt and the Nile
150. When Deadly Enemies Meet
152. Tricks and Weapons of Sea-Creatures
153. Wonders of the Ocean
154. Italy





Classroom Series
Music

THE SYMPHONY ORCHESTRA AND ITS INSTRUMENTS

Demonstrations of orchestral instruments, by individuals and ensembles, with selections from the world's musical masterpieces.

1. The String Choir
2. The Woodwind Choir
3. The Brass Choir
4. The Percussion Group

Physical Education

FUNDAMENTALS OF FOOTBALL

Fundamental processes in this branch of athletics presented as an aid to the high school coach and his squad.

1. Ball Handling
2. Kicking, Blocking and Tackling
3. Position Play
4. The Football Code

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1. PLANT GROWTH
   Illustrated by the life cycle of the pea, utilizing time-lapse photography and microphotography.
2. HOW NATURE PROTECTS ANIMALS
   Examples from animal life showing protective coloration, mimicry, resemblance, agility and other ways by which animals protect themselves.
3. THE DODDER
   A picturesque type of flowering parasite plants.
4. FUNGUS PLANTS
   A study of the mushroom and other fungi with the aid of micro- and time-lapse photography.
5. THE FROG
   The life cycle as representative of the amphibians.

Vocational Guidance

THE BUILDERS

A picture and lecture exposition of the scope and nature of the building trades.

Scene from Teacher Training Film "The Elementary Teacher as a Guide." This picture was prepared by Dr. B. H. Bode of Ohio State University

FINDING THE RIGHT VOCATION

By Dr. Harry D. Kitson, Teachers College, Columbia University.

In which a high school boy succeeds in his attempt to find the right vocation.

Mathematics

THE PLAY OF IMAGINATION IN GEOMETRY

By Dr. David Eugene Smith, Teachers College, Columbia University.

In collaboration with Aaron Bakst, Teachers College, Columbia University, showing largely by animated drawing, how geometry may be made a live and interesting subject.

Scene from Classroom Music Appreciation Film, "The Woodwind Choir" of the Symphony Orchestra series

The Western Electric Portable Talking Picture System

For the presentation of these educational talking pictures, Western Electric portable reproducing apparatus assures results of the same quality as the largest and best-equipped city theatres. The Western Electric Portable Talking Picture System is designed by Bell Telephone engineers and made to the high standards for which Western Electric is known as the maker of the nation's telephones and as a pioneer in the field of sound transmission.

Service

Electrical Research Products Inc., maintains service engineers at more than 150 points located throughout the United States. These men are available on short notice to maintain the quality of sound at the highest level, to care for the equipment at periodic intervals, and to respond to emergency calls.

Acoustic Consulting Service

This is a department of Electrical Research Products that is at the disposal of school superintendents and architects interested in all phases of noise elimination and abatement. Scientific surveys made by these engineers can determine the minimum to which it is profitably possible to reduce noise and improve acoustic conditions.

WESTERN ELECTRIC COMPANY

New York, N. Y.

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Graybar Building, New York, N. Y.

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Western Electric PUBLIC ADDRESS AND MUSIC REPRODUCTION SYSTEM

General

The Western Electric Public Address and Music Reproduction System amplifies, reproduces, and distributes speech and music to an audience of any size in room or auditorium—or to various parts of a building.

A Microphone Picks up the Sound

Developed by Bell Telephone Laboratories for the Western Electric Co., this system has steadily increased its scope of educational and commercial usefulness.

Men who plan modern school buildings are including this equipment in their specifications.

Public Address and Music Reproduction System

The essential parts of this equipment are:

(1) One or more microphones for "picking up" sound
(2) The Western Electric Music Reproducer Set, if recorded entertainment is desired
(3) A receiving unit, if radio programs are to be reproduced
(4) "Mixing" and control panels
(5) Amplifying apparatus
(6) Observer's communicating system for auditoriums
(7) Receivers and projectors or loudspeakers
(8) Necessary wiring and circuits

Modern School Systems Find This Equipment Invaluable

By using microphones and a selective system, school announcements and instructions may be simultaneously delivered to as many classrooms and to as many students as required. In conjunction with the Western Electric Music Reproducer Set, the Public Address System can be operated with standard laterally-cut phonograph records at low cost. In conjunction with a receiving unit, radio programs may be reproduced with original effectiveness.

Uses in Schools

1. Transmitting fire drill instructions
2. Conveying a general order to all rooms at once
3. Transmitting music from the auditorium or from a music teacher to one or more rooms as desired
4. Transmitting gymnasium instructor's commands to all rooms at once
5. Conveying a visitor's, or a special instructor's speech to all parts of the building
6. Receiving and transmitting educational radio programs to all rooms
7. Supplying recorded music from the reproducer for Music Appreciation courses at any time or to any room that fits your schedule
8. Amplifying speaker's voice in auditorium, particularly important for children's weak voices

This Music Reproducer Set is Always Ready to Reproduce a Program of Recorded Entertainment or Instruction

A Graphic Interpretation of the Manner in Which the Public Address System Unites all Classrooms into One

Schools and Colleges Equipped with Western Electric Public Address Systems

Cooley High School, Detroit, Mich.
University of North Carolina, Chapel Hill, N. C.
Claremont High School, Claremont, N. H.
State Agriculture College, Fort Collins, Colo.
Benson Polytechnic School, Portland, Ore.
Herbert S. Hadley School, St. Louis, Mo.
Bastrop High School, Bastrop, La.
Wyoming School, Milburn, N. J.
Alcee-Fortier High School, New Orleans, La.
Roger Bacon High School, Cincinnati, Ohio
Winthrop College, Charlotte, N. C.
N. J. State College for Women, New Brunswick, N. J.
University of Wyoming, Laramie, Wyo.
University City High School, University, Mo.
East End Junior High School, Richmond, Va.
The Robert E. Lee School, New Orleans, La.
College of St. Elizabeth, Morristown, N. J.
Robert Fulton School, Cleveland, Ohio
St. Sylvester School, Brooklyn, N. Y.
Abraham Lincoln High School, Brooklyn, N. Y.
Mamaroneck School, Mamaroneck, N. Y.
Eastern District High School, Brooklyn, N. Y.
School of Dentistry and Pharmacy, Baltimore, Md.
Far Rockaway High School, Far Rockaway, N. Y.
Colton Public School, New Orleans, La.
Central High School, Tulsa, Okla.
Dickinson High School, Hamtramack, Mich.
Belvidere Junior High School, Los Angeles, Calif.
New Kensington High School, Pittsburgh, Pa.
University of Oregon, Portland, Ore.
Agnes Scott College, Decatur, Ga.
Beauregard Public School, New Orleans, La.
Morrisville High School, Morrisville, Mo.
Jefferson Davis Public School, New Orleans, La.
Pennsylvania Soldiers' Orphans' School, Scotland, Pa.

(For a list of additional installations see page 338, 1930-31 edition of this yearbook.)

Cost

The cost of a Public Address System installation is relatively small, considered in the light of its variety of uses—and of the profitable returns direct and indirect from those uses.

The Western Electric Architect's Specification Folder gives complete information on all types of installations and all other data necessary to estimate requirements for any given job. It is available on request direct to Western Electric or through Graybar.

Engineering consultation on any problem can be had for the asking.

Developed and perfected by the Bell Telephone Laboratories, the research laboratories of the American Telephone and Telegraph Company and the Western Electric Company, the Public Address and Music Reproduction System has the latest electrical developments as applied to sound transmission. Western Electric workmanship guarantees the quality and dependability of the system.

Service

Western Electric maintains an emergency stock of repair parts at strategic locations throughout the country.

Testing the Hearing of Pupils with Western Electric No. 4-A Audiometer

Audiometers

Poor classwork by students often is caused by defective hearing. Western Electric No. 4-A Audiometer measures acuity of hearing quickly and accurately with the same standard of measurement for all examined. Essentially a phonograph to which telephonic apparatus has been added, sounds produced in the phonograph are transmitted to the ears of those under examination.

The Audiometer is of particular advantage in measuring the amount of noise present in classrooms or in determining the noise insulating properties of building materials.

Audiphones

For the students with defective hearing the Western Electric Company is prepared to supply either individual or group hearing aids (audiphones), further details of which may be had upon request.

The system consists of a central amplifier and control panel, to which one or more microphones, radio or electro-phonograph can be plugged in. Connected Dynamic loud speakers of improved quality and finer tone are built into the wall of every room. An improved method of wiring makes installation far easier and less expensive than other systems.

The Electro-Acoustic Products Company offers school executives and architects the benefit of its wide experience in engineering, installing and supervising electro-acoustical installations. Write for complete information.

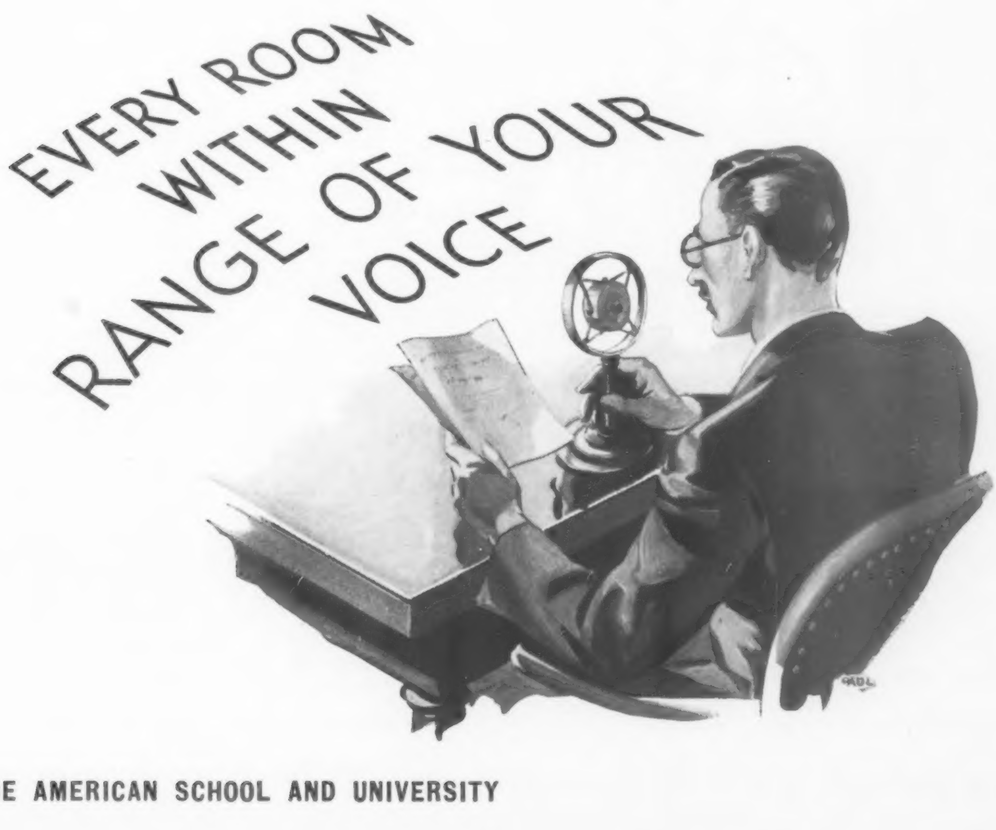
The ELECTRO-ACOUSTIC PRODUCTS COMPANY has pioneered in building amplifier systems for radio broadcasting stations, phonograph recording and talking picture studios. The wide experience acquired in developing equipment for these exacting fields has now been incorporated in ELECTRO-ACOUSTIC SYSTEMS for schools, stadiums, auditoriums and other institutions where it is desired to reproduce voice or music beyond normal audible range.

Typical Installations

Notre Dame University (Two Systems)
Illinois State Normal University
New York Central Railroad
The Coliseum, Chicago
Arlington Heights Race Track
Englewood High School, Chicago
The Chicago Stadium (world's largest indoor arena)
Calumet High School, Chicago

Talking Picture Reproducers

Electro-Products also make a small portable system, for reproduction of sound film in conjunction with educational talking pictures. This model requires no batteries, and is easily moved to any classroom.



HAMMOND'S SCHOOL GLOBES

This new line of globes possesses several points of superiority over all others. One of these is the mechanical construction which reduces to a minimum the chance of breakage, and makes economical repairs possible, should the sphere become dented or scratched. This means economy for the schools because the old-fashioned spheres made of plaster are frequently broken or irreparably dented.

Our spheres are perfectly formed of a thick shell of metal reinforced along the equator by a heavy metal disc. If the shell receives an injury due to a heavy fall, we can press it back to its original shape at little cost.

All of our globes are covered with beautifully colored maps, down to date in every respect and showing the latest changes in international boundaries. They are lithographed in ten oil colors that will not fade, and, after being mounted on the globe balls, the entire surface is covered with high grade varnish. This adds a permanent and attractive lustre to the bright colors of the map and permits the surface to be washed whenever it becomes soiled.

The globes are handsomely mounted on metal or wooden stands, either in plain style, or with fixed or movable meridians.

Every globe is furnished with a metal time dial, placed at the North Pole. It marks the hours of the day. By revolving the dial, it is possible to learn instantly the time at any part of the world.

An illustrated handbook accompanies each globe. It tells how the globe may be used and is especially helpful in teaching the children the many facts it portrays and proves.

Twelve-Inch School Globe

This globe is designed to be of maximum value as a teaching aid in the classroom. The ball is mounted in a movable meridian to facilitate study of southern latitudes. The meridian and fork turn on center post when in normal position and the ball revolves on its own axis in all positions. The center post may be adjusted to various heights, to permit the globe to be seen above the teacher's desk. The tripod stand as well as the meridian and fork are finished in dull green and the tripod has rubber bases on the legs. The ball is equipped with our regular easy-reading time dial.

IN NORMAL POSITION
Height, 45 inches

Send for Catalog and School Prices on this and other styles

IN RAISED POSITION
Height, 67 inches

ALJO MANUFACTURING CO.

130 West 21st Street

New York, N. Y.

ALJO

REG. U.S. PAT. OFF.

The ALJO Line Includes:

- Batik Dyes
- Fresh Flower Colors
- Dried Flower Colors
- Artificial Flower Colors
- Flower Bleach and Fire Proofing
- Dry and Pulp Colors
- Scenic Artists' Supplies
- Aniline Dyes
- Bronze Powders
- Poster Colors
- Scenic Brushes

Of the above products, Art Departments in the higher grade schools and colleges are now making considerable use of our Batik Dyes and Poster Colors, and an ever-increasing number are using our Scenic Colors in the designing and painting of their own scenery for plays, pageants and other functions.

ALJO Batik Dyes

Batik Dyeing and Painting has now become one of the most popular subjects covered in the Art Departments of our high schools and colleges. The Board of Education of the City of New York, after thoroughly examining and testing ALJO Batik Dyes, have adopted them as the most successful and economical dyes for this work. A majority of the commercial Batik concerns are also using ALJO Batik Dyes exclusively, being convinced that these dyes are in every way most suitable for their purpose.

ALJO Batik Dyes are the practical result of ten years of daily experience in direct contact with artists, instructors and students of this line of art, in the course of which we were enabled to study the requirements that were most suitable and to make the selection of colors that would best conform to the nature of the work required.

Let us send you our circular containing a list of the colors, also the various sized packages and prices. A color card and any further information desired will be mailed on request.

ALJO Scenic Colors

Owing to the demand for Scenic Colors received from high schools, colleges and institutions, we have found it necessary to establish a special Scenic Color Department with a complete line of all supplies and colors used for this work.

The interest of school and college audiences is greatly increased by the knowledge that the students themselves have designed and painted their own scenery, and the work is greatly enjoyed by students having artistic ability. For this purpose colors of distinct character, brightness and quality are essential. ALJO Scenic Anilines have a brilliancy and effectiveness which highly commends their use for this work.

Lists of colors and supplies, with prices and other information, will be sent at the request of any school or college official or art department.

ALL-STEEL-EQUIP COMPANY

Incorporated

550 Griffith Avenue, Aurora, Illinois

SALES OFFICES IN ALL PRINCIPAL CITIES

Manufacturers of a Complete Line of Steel Cabinets, Lockers and Unit Shelving

A-S-E STEEL CABINETS

Steel cabinets—because of their lasting beauty, cleanliness, security, resistance to fire and freedom from need of repairs—have become the natural choice of the modern, up-to-date schools. But in making your selection of steel cabinets which will provide the **greatest satisfaction** and present the **most attractive** appearance, consider these many A-S-E advantages in design, construction and finish.

A-S-E cabinets are built from selected steel with two coats of lacquer **hand sprayed** over a baked enamel base—providing a smooth, velvety finish that is extremely durable. This attractiveness in appearance is further enhanced by the use of artistically designed, chromium plated handles and the latest disc tumbler lock such as is used to guard expensive automobiles. Doors are carefully fitted, reinforced full length, and hung on hinges so designed as to prevent sagging. Shelves are easily adjustable without the use of tools, and rabbet strips make A-S-E cabinets dust and vermin-proof. Other advantages, such as the completely enclosed base and three-point latching device, are fully described in Catalog No. C-28.

Two standard types of A-S-E steel lockers. Full specifications, blue prints and descriptions will be sent to those interested in special types of lockers

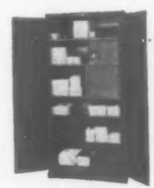
Combination Storage and Wardrobe Cabinet

Single-Door Storage Cabinet

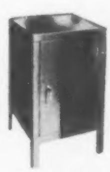
Wardrobe Cabinet

Janitor's Cabinet

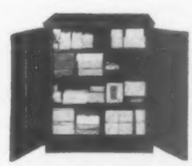
Utility Rack



Combination Cabinet with Compartments



Desk-High Cabinet (Hinged Door)



Counter-High Cabinet

Desk-High Cabinet (Sliding Door)

34 MODELS

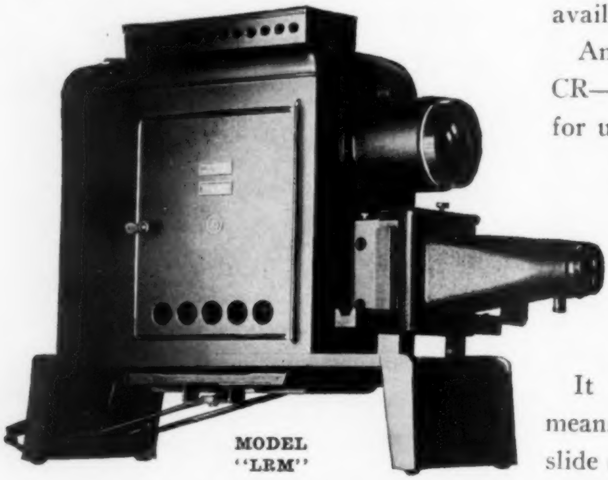
A-S-E steel cabinets are built in 34 different types and sizes to meet all school and university requirements from the janitor's room to the president's or superintendent's office. There are specially designed cabinets, lockers and unit shelving for the gymnasium, library, manual training department, registrar's office, classrooms, domestic science rooms, chemistry laboratories and for all other school needs. All of the above products are **unconditionally** guaranteed and moderately priced. Write for the special Catalog No. C-28, which details the complete A-S-E line.

BAUSCH & LOMB OPTICAL CO.

674 St. Paul St., Rochester, N. Y.

New York Chicago Boston Los Angeles San Francisco
London, England Frankfurt a/M, Germany

Bausch & Lomb Balopticons furnish the best means for utilizing the materials available for visual methods of education.



MODEL "LRM"

There are models for the use of strip film (film slides), for the projection of lantern slides and for opaque objects, models for use where darkened rooms are inexpedient—in fact, there is a Balopticon for every type of "still" projection.

Some of the more popular Balopticons for school use are described on this page.

Model "LRM"

This lantern was especially designed for the projection of either lantern slides or opaque objects in rooms where projection distance does not exceed twenty feet. Hence it is an excellent classroom instrument.

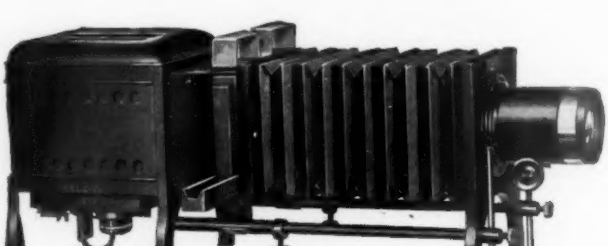
It can be arranged for the use of film slides or even for micro-projection, where desired, by means of attachments which are available.

Another combined Balopticon is Model CR—a truly fine projector. This model is for use in larger halls.

Model "B"

This Balopticon is one of the most popular instruments for use with lantern slides only. It is light, compact and highly efficient.

It can be carried about easily by means of a handle placed directly over the slide carrier at the center of balance. The extension cord can be detached from the Balopticon to facilitate handling.



MODEL "B"

Model B can be obtained for use with ordinary house current, storage battery or acetylene burner.

Bausch & Lomb Optical Company also manufacture Microscopes and accessories, Microtomes, Colorimeters, Refractometers, Spectrometers, Micro-projection Equipment, Photomicrographic Apparatus, Photographic Lenses, Binoculars, etc. Also manufacturers of Orthogon Eyeglass Lenses for Better Vision.

THE BERGER MANUFACTURING CO.

Division of Republic Steel Corporation

Canton, Ohio

BRANCHES AND DEALERS IN PRINCIPAL CITIES

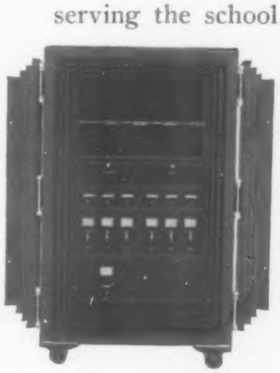
Every school superintendent, business manager or purchasing agent charged with the responsibility of buying school equipment realizes the value of purchasing only dependable materials.

In choosing BERLOY Steel Equipment they select materials of known merit. For 44 years BERLOY Equipment has been on the market.... It is designed and built on a detailed knowledge of the conditions that must be met, acquired through years of serving the school interests of this country, nation-wide.

Among the most popular BERLOY Products are BERLOY Lockers. *Over a million are now in use.*

SIX TYPES OF LOCKERS THAT ANSWER EVERY SCHOOL NEED

STEEL SHELVING THAT SAVES SPACE AND SUPPLIES

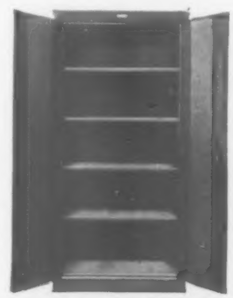


STEEL SAFES WHICH INSURE THOROUGH PROTECTION

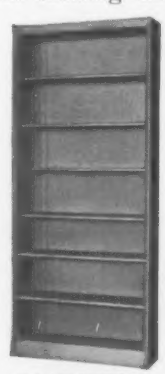
The entire construction is of great strength and rigidity equal to the hard use lockers are bound to receive. The door, for example, is of one-piece steel strongly reinforced on the inside with formed channels. The handle is of sturdy strap steel . . . *non - breakable* . . . with padlock attachment.

The comparatively quiet operation is a factor of great importance. Rubber bumpers are placed at the top and bottom of locking bar. The locking device is positive—always operating securely and satisfactorily.

BERLOY stands today as a dependable source of supply for whatever is needed in steel equipment, both standard and special.



STORAGE CABINETS THAT SAVE TIME AND MATERIALS



BOOKSHELF UNITS FOR ECONOMY IN SPACE AND COST

SHELVING—DESKS—FILES—LOCKERS—STORAGE CABINETS—BOOK SHELF UNITS

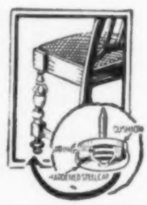
BUCKEYE GLIDE COMPANY, INC.

125 East 23rd Street

New York

BUCKEYE SPRING-KUSHION NOISELESS GLIDES

For School Chairs, Desks and Tables



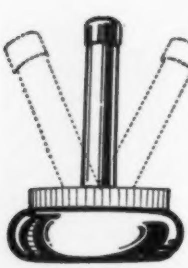
Buckeye Spring-Kushion Glides will banish the scrape and clatter of chairs in your classrooms and offices. They will also prevent the legs, frames and seats of chairs from loosening, thus saving repair bills and prolonging their life. These hard and highly polished steel glides are extremely durable. They move quietly on any kind of floor including stone, eliminating entirely the screech and other noises from moving furniture. They are made for all kinds of furniture including metal. Unlike the usual rubber tip, they last for years.

Construction

The Buckeye Spring-Kushion Glide is solidly built of a hard steel shell which rides on the floor. Within is the tempered steel spring which permits the cap to flex in all directions. The shell, therefore, always makes perfect contact with the floor. A pure rubber cushion and the pin complete the assembly. Each spring cushion has a flat base, which insures the largest bearing surface and longest wear.

Test a set of Buckeye Glides on your chairs at our expense.

CHAIRS—*Make them quiet!*



TYPE P

TYPE A

PHANTOM SKETCH BELOW Shows the Vibration-Absorbing Units of the BUCKEYE GLIDE

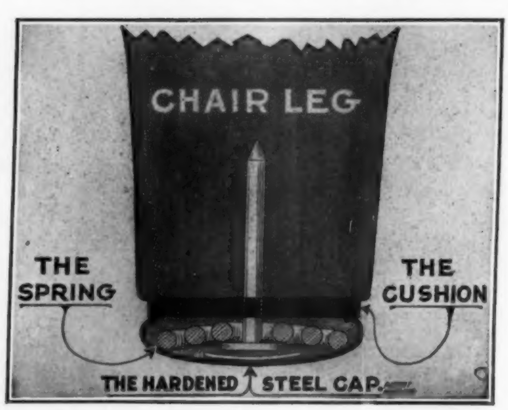
TYPE N

Buckeye Spring-Kushion Glides are made in two sizes to cover the whole range of general use:

No. 136—7/8" diameter—for chairs, light and medium size tables and medium weight furniture generally.

No. 206—1 1/4" diameter—for heavier pieces such as settees, heavy desks and large tables, etc.

No. 206 is also recommended for use on cork, or soft, linoleum floors, or wherever an increased bearing surface is needed to prevent denting.



Ride Your Furniture
on
Spring-Kushion Glides
Always Quiet
Even on Stone Floors
Save Wear and Tear
On Chairs
On Tables
On Floors
On Nerves

PETER CLARK, INC.

Stage Equipment Specialists for Over 25 Years

544 West 30th Street | New York City

Products

Complete Stage equipment for all Stages, large or small, for schools, colleges, auditoriums, convention halls, theatres: Stage Rigging, Counterweight Systems; Asbestos, Rigid Steel and Soundproof Curtains; Draw Curtain Tracks; Electric Curtain Machines; Mechanical Stage Effects; Light and Horn Towers; Portable Motion Picture Booths; Portable Bleachers and Sectional Grandstands; Organ, Orchestra and Stage Elevators.

Guarantee

All equipment is sold with a full guarantee and any defects in material or workmanship will be promptly rectified.

Service

We maintain an engineering department organized to help you solve your stage problems. This service is at your disposal without obligation.

Stage Rigging and Hardware

All types for anything you want to fly, either by hemp lines or counterweight system. A complete line of stage accessories embracing every appliance needed for the modern stage.

Sectional Grandstands

Made in standard sections of the tower and girder type construction of interchangeable units. They are flexible in length and height. This type can also be covered with portable flooring forming a ramped floor.

Fire Curtains

Flexible asbestos fire curtains of plain or woven wire cloth. Curtains with rigid steel frame and a layer of cloth on both auditorium and stage side of curtain. Curtains with sheet metal face and vitrified asbestos back on structural frame.

Soundproof Curtains

Used to separate gymnasiums from stage and auditoriums.

Curtain Tracks

Noiseless steel tracks for various size curtains. All tracks designed for easy hanging.

Curtain Machines

Quiet, smooth running machines for operating curtains from remote points.

Motion Picture Booths

Portable booths made of asbestos transite and angle iron for use in building without a permanent booth.

Portable Bleachers

Designed for your seating requirements. Easily handled and require minimum space for storing.

Draperies

Stage curtains and cyclorama settings of fabrics selected for both finish and service. The excellent workmanship on our curtains reflects the high type of the artisans that manufacture them.

A Peter Clark, Inc., Installation Assures Faultless Operation. "Performance Counts."

"Stage Equipment with a Reputation"

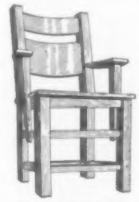
P. DERBY COMPANY

Manufacturers of

MOVABLE CORRECT POSTURE SCHOOL AND KINDERGARTEN FURNITURE
OFFICE CHAIRS, FOLDING CHAIRS, AND MISCELLANEOUS SEATING

25 Washington St., North
BOSTON, MASS.

844 Rush St.
CHICAGO, ILL.



FACTORIES
Gardner, Mass.

145 South Spring St.
LOS ANGELES, CALIF.

1 Park Ave.
NEW YORK, N. Y.

KINDERGARTEN, MT. HEBRON SCHOOL, MONTCLAIR, N. J.

FIRST GRADE, MT. HEBRON SCHOOL, MONTCLAIR, N. J.

With the objectives of education constantly broadening in scope, many school authorities find their equipment problems becoming proportionately difficult.

Furniture of a type which a decade ago served its purpose satisfactorily is often found to be entirely unadaptable to modern educational methods.

It is an essential point in Derby policy to work in close cooperation with leading educators; to determine what they wish to accomplish in the school room, and then to build the kind of equipment best calculated to meet their requirements.

Through this mutually helpful association Derby has been able to produce a line of movable, correct posture school and kindergarten furniture which for a number of years has been outstanding in its field.

The famous 7000 line of posture chairs is in use in many of the country's finest schools. This anatomically correct chair, together with the Derby desk, forms a unit which exerts a definitely beneficial influence on posture and health.

To assist in the clearing up of your equipment difficulties, Derby seating experts are glad to make available to you the highly specialized information which this company has accumulated through extensive investigation and long experience in the manufacture and installation of hygienic school seating.

A Complete Seating Service

The Derby line of products includes:

Correct posture school and kindergarten chairs
School desks and tables
Kindergarten tables
Tablet arm chairs
Office chairs
Chairs and tables for dormitories, libraries, dining rooms, infirmaries and chapels
Single folding chairs
Portable auditorium seating
Windsor chairs

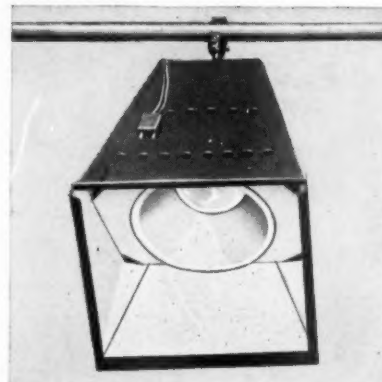
For catalog and complete information address sales office nearest you.

DISPLAY STAGE LIGHTING COMPANY, INC.

410 West 47th Street, New York, N. Y.

Products

Complete lighting equipment for the school stage or outdoor pageant; standard units or specially designed apparatus; theatrical lighting effects, apparatus and supplies; and spectacular and electro-mechanical effects.



FLOODLIGHTS FROM $20.00 TO $40.00 DEPENDING UPON SIZE

Baby Hercules Spot and Flood Light

This light is especially adapted to the small auditorium or theater. Hung in any position, it will turn in all directions, throwing light where desired and focusing on any chosen object, throwing it into bold relief.

The hood is constructed of stamped steel, finished in dull black. The light is thoroughly ventilated at top, back, bottom, and around the lens; carries a 250 to 400-watt concentrated filament Type G 30 lamp; has a 3¾-inch spherical reflector, a spring clip device for color frame, a sliding lamp base which allows adjustment of focus, and a 5-inch imported condensing lens. The front of the light is detachable, giving ready access to the lamp, also converting the light from a spot light to a flood light.

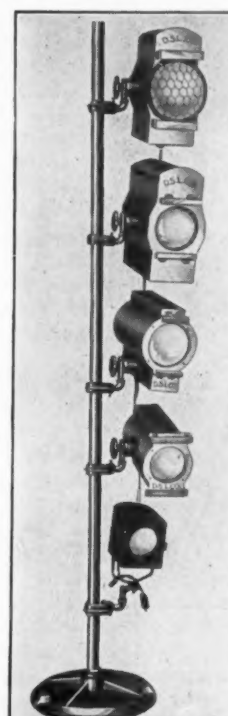
Standard Mazda Spot Light

This light has a hood of the same size and design as our Standard Arc Spot Light, but replaces the arc burner with a Mazda lamp. It is universally accepted because of its flexibility, its small weight, its steady burning on either direct or alternating current, the facility with which the intensity of its light can be controlled, and the accurate blending of colors by means of dimmers. The beam is concentrated where the light is actually required, thus eliminating all light waste. Spot lights are made in various sizes to accommodate the concentrated filament Mazda lamp ranging from 250 to 2000 watts.

DISPLAY LIGHT JR.

Miniature combination spot light and flood light, 100 watts —"the light of a thousand uses."
on stand ..$13.00
hanging ... 12.00
Ideal for Marionettes

For other types of lights, including the Stand Type Aluminide Flood Light and the Hanging Flood Light, send for our complete "Catalog of Theatrical Lighting Equipment and Effects."



SPOT LIGHT TYPES

8″ 1000-2000 watts	on stand	$54.50
	hanging	50.00
6″ 1000-2000 watts	on stand	$45.00
	hanging	44.00
6″ 500-1000 watts	on stand	$42.00
	hanging	41.00
5″ 250-400 watts	on stand	$27.50
	hanging	27.00
5″ 250-400 watts "Baby Hercules"	with base	$14.50
	high stand	20.00
New Square Spot 1000-2000 watts	8″ on stand	$50.00
	8″ hanging	49.00
	6″ on stand	44.50
	6″ hanging	43.50

DUDFIELD MANUFACTURING CO.

Manufacturers of

Patented Chalk Rails and Metal Blackboard Trim

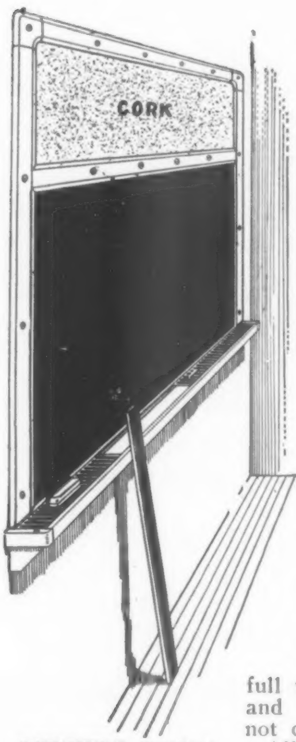
116 West Kansas St., Liberty, Mo.

PRODUCTS

Dustless All-metal Crayon Trough with Eraser Cleaner; **Metal Blackboard Trim; Sanitary Metal Base.**

Also Chair Rail Wainscot Trim and Fittings.

DUDFIELD'S DUSTLESS ALL-METAL CRAYON TROUGH, DUST TRAYS AND ERASER CLEANER



DUDFIELD Dustless All-metal Chalk Rail and Metal Blackboard Trim

The main trough is made of one piece of No. 24 gauge special tight coated galvanized "Cop-R-Loy" iron in 8 and 10-ft. lengths. Cast metal ends and mitered corners are used, adding to its stability and making installation easy. Sections are butted together when installed, the ends being held in position by a concealed metal bracket at the joints.

Dust trays are made of No. 28 gauge "Cop-R-Loy" galvanized iron in 47-in. lengths for ease in cleaning. Eraser cleaner is made of No. 20 gauge galvanized iron. The slotted construction gives a scraping effect the full width of the cleaner and being smooth does not cut the erasers.

All units except the dust trays and eraser cleaner are given a priming coat of good quality gray paint at the factory.

Distinctive features are as follows:

Sanitary — Eliminates chalk dust from the room.

Time Saver — A slight rub on the screen keeps the eraser clean.

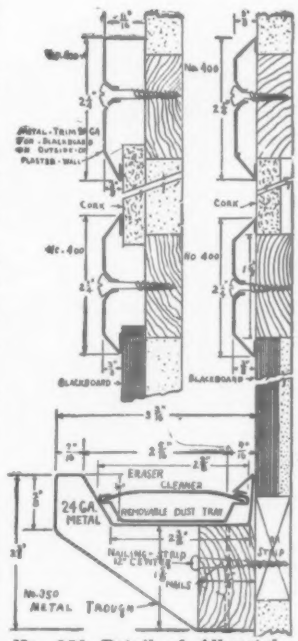
Fireproof — Made entirely of metal.

Artistic—Simplicity of construction enriches appearance.

Durable — Heavy gauge metal withstands hard usage.

Practical — Does not warp out of shape or away from the blackboard.

DUDFIELD'S METAL BLACKBOARD TRIM



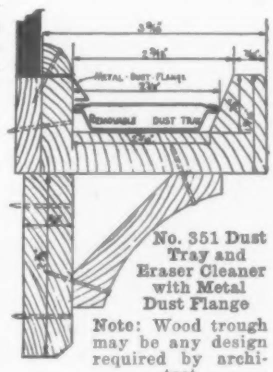
No. 350 Detail of All-metal Trough, No. 400 Metal Trim

Made of No. 20 gauge special tight coated galvanized "Cop-R-Loy" iron in 8 and 10-ft. lengths. No. 400 pattern is for use on blackboards set flush with walls; and pattern No. 400-A for blackboards set on outside of walls. The No. 400 pattern is usually preferred for the reason there is no ledge to catch dust. Corner caps and "T" fittings furnished. The No. 400 pattern can be used as a wainscot cap, also chair rail interior and exterior angles furnished. Primed at factory with a coat of good quality gray paint.

OFFICIAL ENDORSEMENT AND SAMPLES

These products have been endorsed by State school superintendents, boards of health, architects, universities, colleges, sanitary and ventilating engineers.

Specifications for installation furnished on request. Write for samples, full size detail drawings and literature.

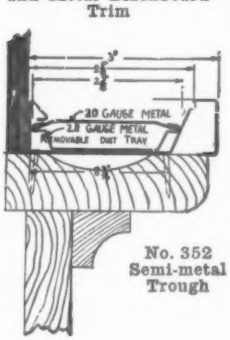


No. 351 Dust Tray and Eraser Cleaner with Metal Dust Flange

Note: Wood trough may be any design required by architect

SECTIONAL VIEWS OF DUSTLESS CRAYON TROUGH

Only metal parts are furnished by the manufacturer. Metal trough, metal trays and blackboard trim cut to exact lengths when ordered; give outside measurements of blackboards over all. When ordering, state whether blackboards are set flush with or on outside of plastered walls.



No. 352 Semi-metal Trough

E. I. DU PONT DE NEMOURS & CO., INC.

Fabrikoid Division, Newburgh, N. Y.

Text-books Bound in Du Pont FABRIKOID Are Cleanable, Sanitary and Long-Wearing

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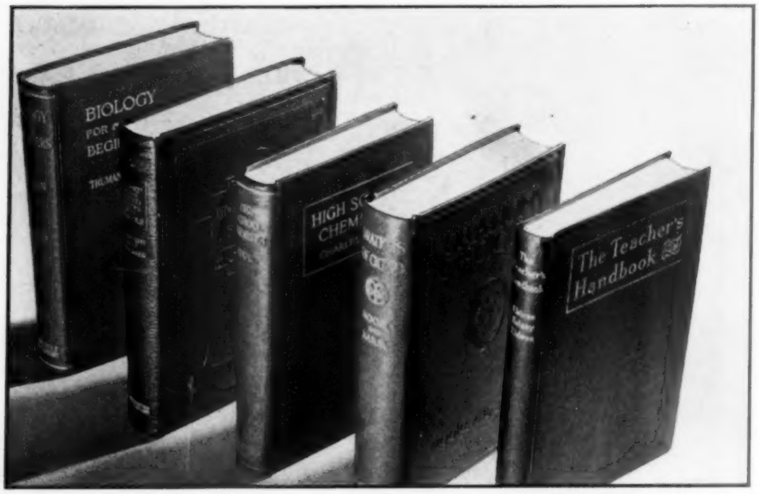

Book straps, scuffing, dirt and dampness all join to shorten the life of a text-book.

A cover of du Pont **Fabrikoid** staves off these enemies and gives the student a book that remains attractive and practical throughout the life of the text pages. **Fabrikoid** is a rugged, tough material that is wear-defying. It is made of pyroxylin, the same basic substance used in the famous du Pont Duco. This gives to **Fabrikoid** its beauty, cleanability and rugged characteristics.

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Encyclopedia Americana
Funk & Wagnalls Company
Ginn & Company
Alexander Hamilton Institute
Henry Holt & Company
Houghton Mifflin & Company
International Textbook Press
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G. & C. Merriam Company
Row, Peterson & Company
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Thos. A. Edison's New Dictating Machine

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The Globe of Many Uses

In every classroom the globe should be an active teaching tool. It should be neither too expensive to allow the children to handle nor so bulky and heavy to lift that the easy course for teacher and pupil alike is to let it severely alone.

GARRIGLOBES are built on an entirely new construction principle. They lend themselves to valuable new uses. Neither fragile nor heavy, they are just right to hold and pass around—and one model may be written on with chalk and washed cleaner than a blackboard.

The globe balls are permanent cases with interior bladders—much more than tough enough to be dropped without injury. They are made like basketballs—true and rigid globes that stand up under careless handling.

Familiar, friendly handling of these globes—or actually drawing with crayons on the globe surface—builds true mental images in the minds of the pupils, giving them more exact ideas of locations, sizes and distances than a flat map can ever give.

Care and patented principles have made the Garriglobes accurate — inexpensive — beautifully vivid globes—that are earning the praise of teachers who have them.

Map-Making with a Garriglobe

Most children delight in map-making—especially product or animal maps, or such a fascinating, up-to-date pastime as the tracing of the most famous recent airplane journeys or dirigible journeys made by the Lindberghs and Hawks of today. The map illustrated below has a splendid chalk-taking surface for such purposes. A south-pole handle makes the globe easy to hold while the pupil is drawing.

A valuable text-book for use in connection with this globe is entitled "World-Picture Building." This book by J. Russell Smith, Ph.D., author of "Home Folks" and "Human Geography," contains a series of sixty-one activity lessons, with twenty world maps, and will be found remarkably helpful in arousing the children's interest in making their own maps and drawings on the **Garriglobe.**

Write for descriptions and prices.

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Gaylord Bros., Inc., is an organization that has for many years successfully specialized in the library field. The name—Gaylord—is well known in library circles throughout the country. When selecting the manufacturers from whom to purchase your school library supplies and equipment, it is always wise to consider both their experience in the library field and their general standing in the trade.

Our manufactures include: Tables, Shelving, Bulletin Boards, Catalog Cabinets, Book Display Cases, Files, Chairs, Book Trucks, Charging Desks and Magazine Racks; also Catalog Cards, Book Cards, Pockets, Magazine Binders, Book Repair Materials, and all necessary miscellaneous library supplies.

Send for catalog. Also, if you desire, estimates, furniture layouts and suggestions for new or established libraries will be furnished on request without charge or obligation.

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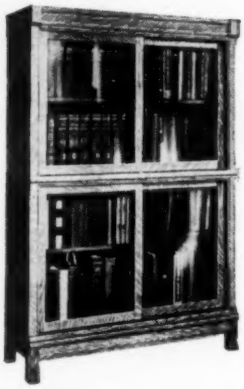
DANNER REVOLVING BOOKCASES — **KING OFFICE FURNITURE**
Also DRESSERS — BEDS — SPRINGS — MATTRESSES



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(3) Easy assembly construction—yet absolutely rigid. May be stacked three and four double sections high.

(4) Extra-heavy paneling construction.

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Top—24 inches square. Bottom shelf—12 inches high. Top shelf—11 inches high. All shelves 8¾ inches deep. Shelf capacity, 96 inches.

Also made in three-tier size with 144 inches shelf capacity.

Sectional and revolving bookcases made in all standard woods and finishes

Our line also includes King office desks, chairs and wood filing cabinets—medium priced. Acme steel and wood folding chairs—the world's standard of value.

Also dormitory furniture: Wood dressers, chests, chifforobes, desks, wardrobes, metal beds, bed springs and mattresses.

Separate catalogs of each of the above lines furnished on request.

We specialize in school and office furniture.

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White Plains, N. Y.

Today with classes in both public schools and colleges bigger than ever before in history, the public school superintendent or principal as well as the college president would be well-nigh enslaved by office routine if it were not for modern office equipment. An important step forward in recent years has been the devising of visible loose leaf records for the improvement and speeding up of school office procedure.

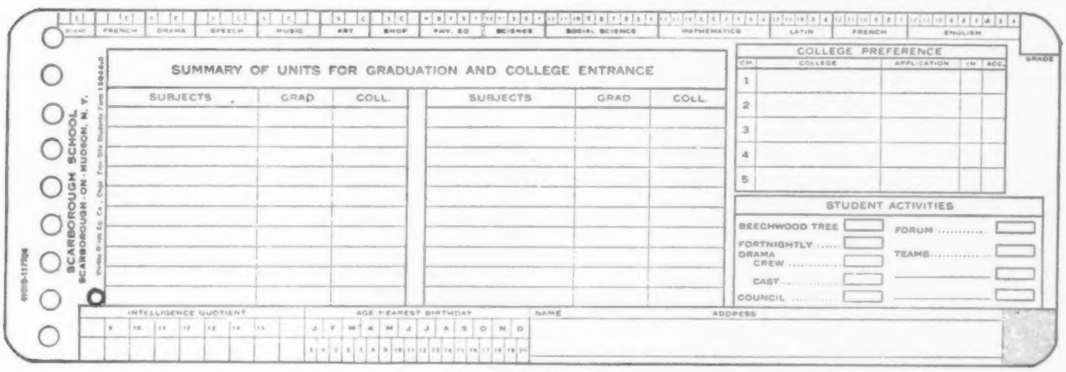
Visible loose leaf records have been successfully used by many business concerns for the last decade. Social Service Systems, Inc., now makes available to school executives a number of visible record systems specially adapted to their needs that will release them from much of the drudgery of former days.

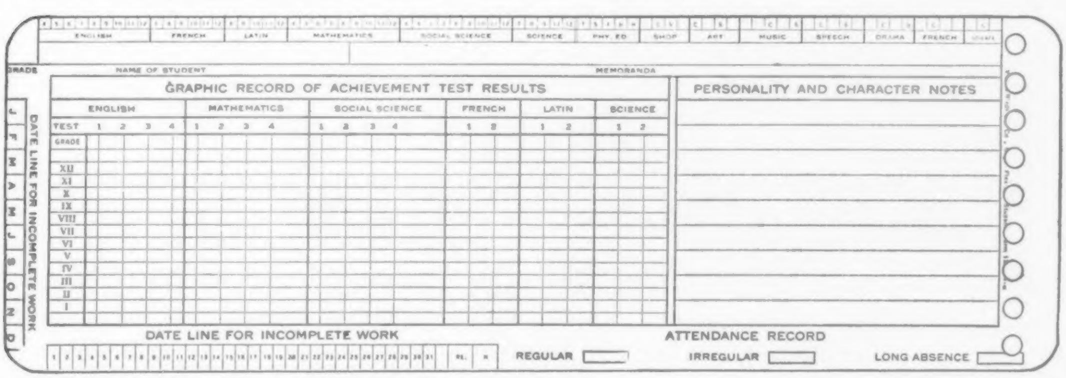
To show how Social Service Systems visible records can be used to best advantage, we have prepared a booklet entitled, "The Use of Social Service Systems Visible Records Equipment in the Scarborough School," which will be sent upon request to any interested school or college executive. In this booklet the following special uses of visible records are discussed:

1. Memorandum Ticklers for the Follow-Up of Communications and in Planning a Year's Administrative Program
2. Visible Records Used in the School's Financial Administration
3. Visible Records in Teacher Supervision
4. Accumulative Student Records
5. Health Records
6. A Director's Pupil Record

Sample record forms are illustrated below. We are prepared to furnish visible loose leaf record forms in any shape and any wording desired.

Write us for more complete information.





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Steelcase Desks are adaptable for every purpose in universities, colleges and schools. The line is complete—a desk for every need—flat top desks, typewriter desks, special desks, executive type desks, office tables, laboratory tables, student desks. Built of steel to withstand hard usage, unaffected by atmospheric conditions, impervious to chemicals, Steelcase Desks afford unfailing efficiency and permanent satisfaction.

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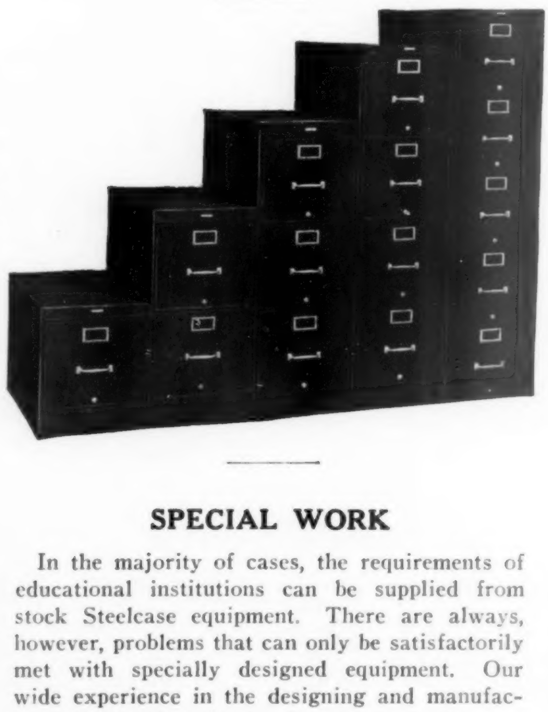
Strength, rigidity, enduring beauty, adaptability—these are Steelcase attributes. The Steelcase line of filing equipment has been designed to give unlimited service. Exceptionally easy and quiet operation of drawers, patented features of steel construction, attractive and permanent finishes, all these are reasons for the selection of Steelcase. Clean-cut lines and correct designs make these files match the finest furniture.



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Specially designed Steelcase exhibit cases installed in the Pathological Laboratory of the University of Michigan.

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In the majority of cases, the requirements of educational institutions can be supplied from stock Steelcase equipment. There are always, however, problems that can only be satisfactorily met with specially designed equipment. Our wide experience in the designing and manufacture of special equipment is at your service.

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PROSE-MACO PRODUCTS

Wardrobes
Prose-Maco, Prose-Maco Junior and Semi-Multo
Combination Bookcase, Teachers' Wardrobe and Rest Room
The Swinging Bookboard
Metal Book and Hat Containers
Removable, Non-Removable Coat Hangers
Umbrella Containers
Drawing Stands to Accommodate Six Students

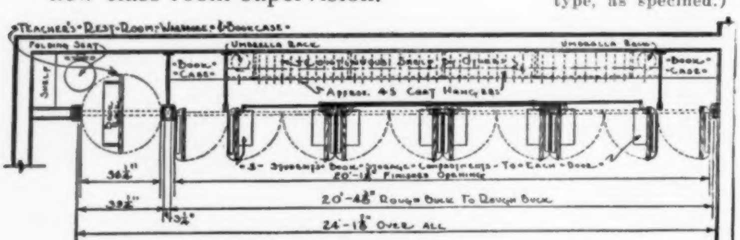
DESCRIPTION

1. All types of wardrobes have 42-inch openings.
2. Blackboards on doors, when open, are back to back, slate then protected; 2 doors on one leg—double adjustment on each leg.
3. Single-control multiple operation, except for Semi-Multo type which operates 2 doors at one time.
4. Prevents petty pilfering and creates new class-room supervision.
5. Perfect alignment (doors cannot be pushed in a fraction of an inch). Bars and rabbets. Bronze door stops on jamb.
6. Ball-bearing operation.
7. All solid bronze operating arms and hardware or steel.
8. Requires only a 13-inch recess (17 to 20 recommended), saving space in cubic contents in a building.

Swinging Bookboards 4′ 0″ wide and 3′ 0″ high, in 2, 4 or 6 leaves, genuine Bangor slate finished both sides of each leaf. Four leaves contain 96 square feet of writing surface or 12 square feet more than front blackboard across a standard width class room. Hinges and corner clips of bronze. Banding is steel and Parkerized rust-proof black. Leaves remain rigid when pushed into any position. One leaf extended straight out would sustain exceptional hanging weight without straining.

Note:—Interior equipment for all Wardrobes is optional, including Combination Bookcase, etc., Bookcase Doors, Shelving, Coat Hangers, Brackets and Umbrella Containers, Metal Book and Hat Containers; and Slat on Wardrobe Doors.

(Note:—Kind of wood for Doors, either flush or panel type, as specified.)



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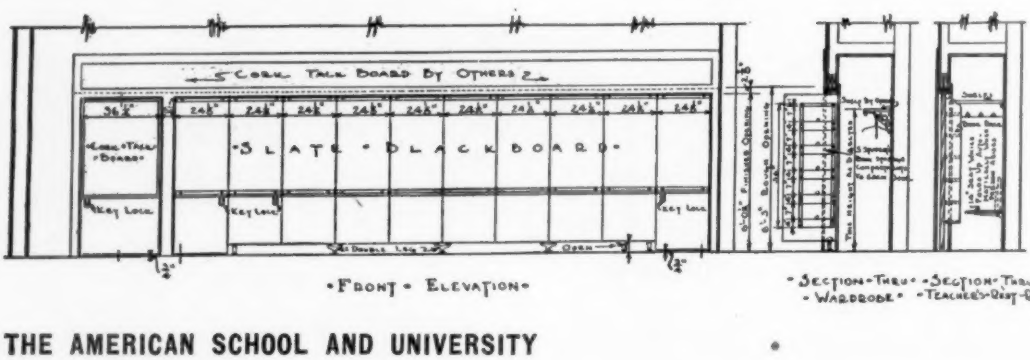
Estimates, layouts and suggestions for new and established schools furnished upon request without obligations or charge.



•FRONT • ELEVATION•

•SECTION-THRU• •WARDROBE• •SECTION-THRU• •TEACHER'S-REST-ROOM•

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teaches, entertains or commands as principal desires. Aural and visual monitoring assures correct volume in each room. Lecturer or artist can be in principal's office, auditorium or where desired. Widely used for setting-up exercises, motion picture accompaniment or dances.

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The SAMSON ELECTRIC COMPANY, which has held a leading position in communication engineering for nearly half a century and accumulated valuable information from its many installations in nearly every possible field of application, guarantees that Samson Amplifying Equipment is right and that its excellent service will be rendered for years to come.

For telephone and fire-alarm equipment see page 149.

PMR 40 PAM CENTRALIZED AMPLIFYING EQUIPMENT

EXAMPLE OF CARE USED IN DESIGN

A nation-wide survey among school boards, superintendents, principals and teachers, supplied a composite picture of their needs. Then the Samson Amplifier Systems were designed to meet these needs.

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LITERATURE

Write for Bulletin ASU2 and ask for names of the many schools, colleges and universities already equipped with Pam amplifier systems so that you can check on the results obtained by them.

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Manufacturers of

MICROSCOPES—MICROTOMES—DELINEASCOPES

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BRANCHES

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The Real Classroom Opaque Delineascopes—Models Q and QA (QA illustrated)

After months of carefully studying actual class conditions and requirements, we have developed a special opaque projector to meet the daily needs of every teacher. The instrument may also be adapted to take the standard glass slides, interchangeably with the opaque material. It is so designed as **to give a good, clearly defined screen picture without completely darkening the classroom,** a feature which has heretofore been impossible without the aid of a special screen.

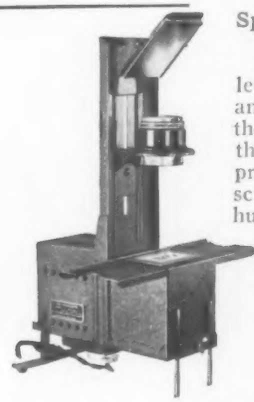
In this model one may use books, or pages therefrom, drawings, theme papers, charts, maps, photographs, post-cards, etc., of any size, the free space being 20 inches, with the height of the tray 5 inches from the table. The instrument itself is 9 inches wide and 20 inches long. The opaque aperture is 6 x 6 inches, but the supporting tray is of sufficient size to accommodate larger material, of which a 6-inch area may be shown at one time.

Model Q accommodates opaque material only.

Model QA accommodates both opaque material and standard glass slides interchangeably. A filmslide attachment may be added permitting the use of filmslides and micro-slides.

The operation of these instruments is simplicity itself. Convenient handles are provided for ease in carrying the projector.

Write for Descriptions and Prices

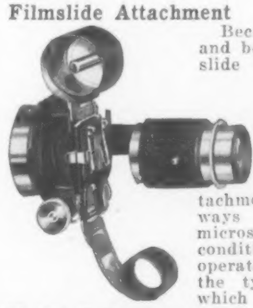


Spencer Lecture Table Delineascope, Model B

This projector permits the lecturer to face his class and at the same time have the projector at hand with the *slide right side up.* It projects the picture on a screen above your head, hung in full view of each and every student. By having the slide right side up all thought of the screen image may be banished, the lecturer devoting his entire attention to the class and the slide before him. With a pencil or other pointed object he may point out the details of the slide, knowing that every movement will appear on the screen.

This all becomes an integral part of the regular work, for Model B is sufficiently compact to be left set up on one corner of the lecture table, ready for instant use whenever an illustration would better bring out a certain point in the lesson.

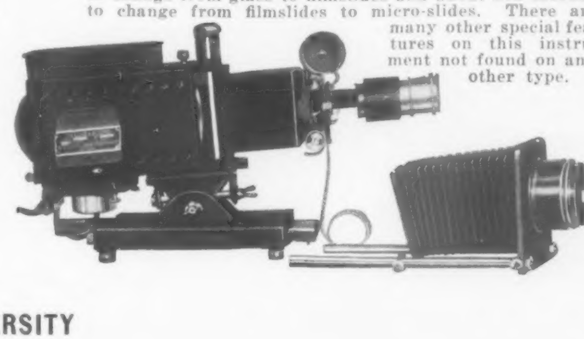
Filmslide Attachment



Because of the growing demand and because of our extensive filmslide library, a means is often sought for projecting filmslides on a Delineascope or other lantern designed for lantern-slide projection. This **Filmslide Attachment** is the answer. All Spencer filmslide attachments are equipped with slideways for the 3-inch x 1-inch microslides. In ordering, specify conditions under which you will operate, the results desired and the type of the instrument for which attachment is required.

Model DC—Combination Classroom Lantern

Model DC is the best classroom outfit where a general utility lantern is required. It is a combination lantern—projecting lantern slides, filmslides and microslides interchangeably. It takes just eighteen seconds to change from glass to filmslides and about five seconds to change from filmslides to micro-slides. There are many other special features on this instrument not found on any other type.



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Willson's Gummed Paper Letters, Figures, Symbols and Tape, made only by The Tablet & Ticket Co., are die-cut from best quality glazed, waterproof, gummed paper. They are easily applied, durable and attractive. They are carried in stock in a variety of styles in sizes from ⅛ inch to 4 inches high.

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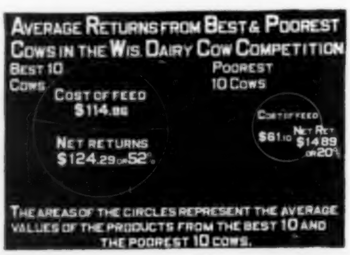
Willson's Gummed Paper Letters, Figures, Symbols and Tape answer every lettering purpose and are especially adapted for making analytical charts and graphs, signs, indexes, marking files, records, maps, etc. Science instructors and laboratory instructors find them indispensable.



USERS

The leading educational institutions of the world use Willson's Paper Letters, Figures and Symbols, among our regular patrons of long standing being thirty State Universities, Columbia, Northwestern, Chicago University, Harvard and Yale.

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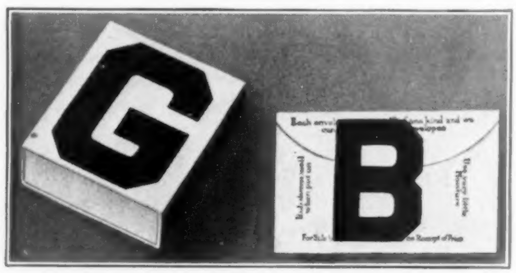
Standard stock colors of letters and figures are white, black and red. The symbols and tape are carried in white, red, black, blue, green, orange, silver and gold. We will cut special colors on order.

STYLES

Three styles of letters and figures are available—Cheltenham, Block and Gothic. These styles have been standardized because of their legibility and general acceptance as the most desirable faces for display lettering.

PACKING

Letters and figures are packed 10 of one character to an envelope or 100 of a character to a box. Symbols are packed in boxes of 100 only. Assortments of 1,000, 2,000 or 5,000 characters are the most convenient and most economical method of purchase, the envelopes and boxes being purchased as refills for the handy assortment boxes.



SEND FOR FREE SAMPLES

Free samples of Willson's Gummed Paper Letters and Figures, and our latest catalog will be sent on request. Tell us your lettering or marking problems and we will gladly advise a solution.

OTHER PRODUCTS

The Tablet & Ticket Co. also manufacture Changeable Bulletin Boards; Electric Directional Signs; Door Plates; Cardboard Letters and Educational Puzzle Maps.

TERRELL'S EQUIPMENT COMPANY

STEEL STORAGE EQUIPMENT

STORAGE CABINETS — WARDROBES
LOCKERS — SHELVING

Grand Rapids, Michigan

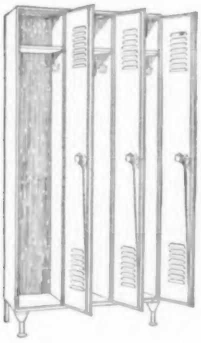
STORAGE CABINETS

Books, records, supplies, stationery—material too valuable to be left unprotected on open shelves—can best be stored in Terrell Steel Cabinets, behind the protection of locked, steel doors, away from the eyes of the curious, safe from petty pilfering, free from dust and rodents.

Made of heavy, high-grade furniture steel, Terrell Cabinets are rigidly built to assure a lifetime of service. They do not wear out, depreciate or get out of order.

STORAGE CABINETS

LOCKERS



LOCKERS

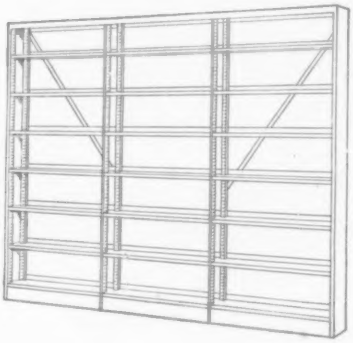
Terrell's Steel Lockers give permanent satisfaction. They are strongly built of heavy steel, capable of withstanding abuse, and remain in perfect operating condition without constant attention. Attractive in design and appearance, Terrell Lockers are preferred where quality is considered.

Terrell's Lockers are made in a variety of sizes and styles and are adaptable to every purpose. Especially suitable for colleges, schools and gymnasia, where space is limited and a large number must be accommodated.

SHELVING

Terrell's Library Type Steel Shelving has been especially designed for book storage in libraries, colleges and schools. Years of experience in the design and manufacture of heavy-duty steel shelving for commercial purposes have enabled us to incorporate in steel book shelving many features and improvements. The result is a light, easily handled, quickly adjustable steel shelving, built on the unit principle, which may be added to, rearranged or moved without special tools.

SHELVING



WEBER COSTELLO COMPANY

Manufacturers for nearly half a century
OF
SCHOOL APPARATUS AND SUPPLIES

Chicago Heights, Illinois

OVER 55 WAREHOUSES STRATEGICALLY LOCATED THROUGHOUT THE UNITED STATES AND CANADA INSURE IMMEDIATE DELIVERY

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Bacon Semi-Contour (Political-Physical) Maps meet ideally today's modern classroom needs. Combining both political and physical phases of the countries of the earth . . . they simplify problem solving . . . save time and effort. Edited to correlate with text books in current use . . . adaptable to every modern teaching plan, these Maps are an indispensable aid to every teacher of Geography. A unique color scheme is employed which makes the various physical regions stand out prominently—and at the same time presents the political features clearly.

Bacon Standard Political Maps serve a dual purpose in the classroom. They are not alone effective tools for the teaching of Geography, but also provide a method for teaching political data that can be used effectively in presenting relationships and industrial development.

UP-TO-DATE MAP GLOBES FOR THE CLASSROOM

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W. C. Map Globes are designed by authoritative cartographers with the collaboration of educational counsellors, to serve as efficient, modern teaching aids.

There is a W. C. Globe of the proper size and map content to meet every modern classroom need . . . to fit in with any teaching plan.

Accurate and up-to-date in every detail, W. C Map Globes include only **useful** teaching data.

They are attractively colored so that every feature stands out in its proper relationship. Text matter is clear to insure legibility and easy use.

One of the most versatile pieces of teaching equipment today is a **Slated Outline Globe.** The new W. C. Slated Outline Relief Globe is an accurate reproduction of the earth with correct land masses and water areas. It includes every major land area in **relief.** Write for information on it now.

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Sterling Lifelong Blackboard
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The Map-O-Graph **The Map Printer**
(for producing desk outline maps)
Alpha Dustless Crayon
Blackboard Erasers
Framed Blackboards
Blackboard Accessories

WELFARE SEATING COMPANY

42 Madison Street
Waukegan, Illinois

We build more than one hundred school desk models—all around one fundamental idea.

Our Bear Paw Pedestal line is intended to be fixed to the floor. Our Staput Movable Pedestal line, of which the desk here shown illustrates Model 8, is intended to be used either as fixed-to-the-floor or as movable.

There is nothing mysterious about the line. All mechanical details have been proved in use. All principles of leverage are practical and have been accepted by the leading educators of the country.

In the way of adjustments we believe in rapid manipulation; positive adjustments; simplicity. In the way of construction we leave out spot welding; you find no riveting; we believe in one piece where possible regardless of expense or we bolt properly.

We believe in eliminating the evil effects of vibration. Our engineers, when developing improvements are governed mechanically by the one rule, "What will vibration do to it in the long run?" Then they look for the off-set to vibration and the construction is developed correctly.

Seating never can be a cure-all as some would have it. We believe in common sense in seating; we believe in keeping our feet to the ground; we believe in trying to solve the ordinary problems of the school room without stepping into the field of the doctor. We build no seating that takes the place of the doctor and his kit.

But we have brought greater efficiency into the school room; the line is large enough for thorough selection; the price range is adequate.

If you can lay before us your actual seating problems we can present you with helpful facts and figures; we can send intelligent men who know that seating must meet the every day demands of the school room; we can sell you a product that mechanically will bring you more than you expect.

We invite your sincere questioning—the line is built to that end.

WRIGHT-DE COSTER, INC.

Makers of WRIGHT-DE COSTER SPEAKERS

2249 University Avenue, St. Paul, Minnesota

HYFLUX

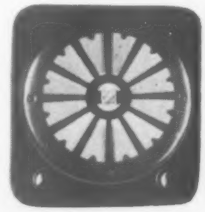
This exceptionally efficient Wright-De Coster Speaker is one of the most popular types used in school installations. It is a balanced armature type magnetic speaker, having a marvelous range and a rich, mellow tone. It is equally satisfactory for the reproduction of speech or music.

WD

The Speaker of the Year

HYFLUX

The surface wall mounting type HYFLUX, shown at the left, is in a beautiful walnut cabinet. Flush wall mounting type, shown at right, is used for installations in new buildings or where it is possible to cut a hole in the wall to accommodate conduit box.



One of the class rooms in the Washington Junior High School, Duluth, Minn. Every room in which students assemble is equipped with Wright-De Coster Reproducers connected with a complete double program, radio-phonograph and public address system.

This is Mr. G. A. Chamberlain, principal of the Riverside High School, Milwaukee, Wis., at the microphone of the speech amplification system. This school has 55 Hyflux and 5 dynamio speakers, all Wright-De Costers, in its sound system.

The Cretin High School, St. Paul, Minn., is well pleased with its Wright-De Coster Speakers installed above the stage of the auditorium and gymnasium shown above. They give volume, clarity and complete coverage of the auditorium.

The auditorium of the Upper Darby Junior High School, Upper Darby, Penn., has a Wright-De Coster Speaker on each side of the stage. There are also 54 Hyflux speakers in class rooms and shops, and a dynamic speaker in the gymnasium of this school, giving satisfactory service.

Section VII

COMMERCIAL EDUCATION

Facilities for Teaching Commercial Subjects in High Schools

BY EARL W. BARNHART
CHIEF, COMMERCIAL EDUCATION SERVICE, FEDERAL BOARD FOR VOCATIONAL EDUCATION, WASHINGTON, D. C.

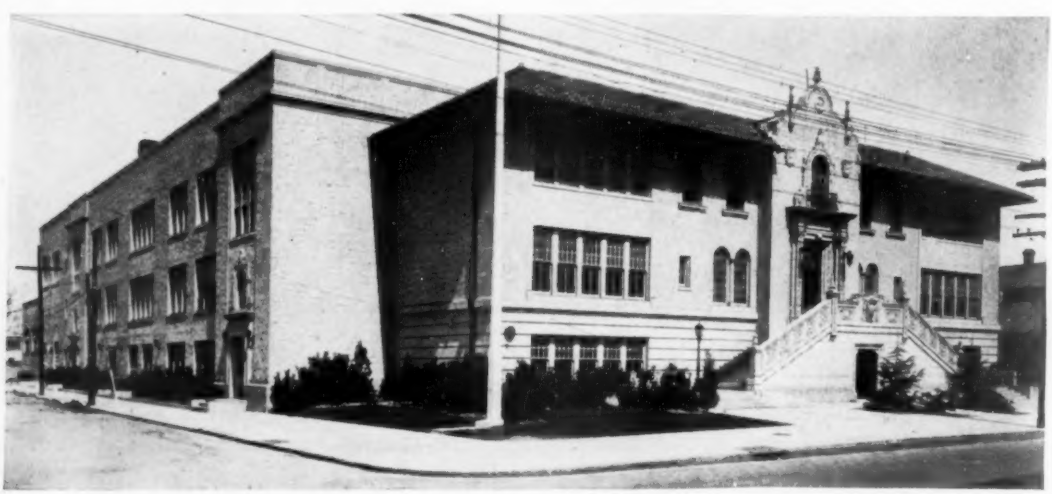
HIGH School of Commerce, as the *name* of a secondary school, is now quite out of date in this country. Before 1910, almost every large city, and some small ones too, boasted of a secondary school with that name. But in the last twenty years not more than two out of thousands of new high schools built have been thus christened. The present style in high school names has generally contributed to the selection of those which quite conceal the primary purpose of the institution.

Demand for Commercial Subjects Increasing

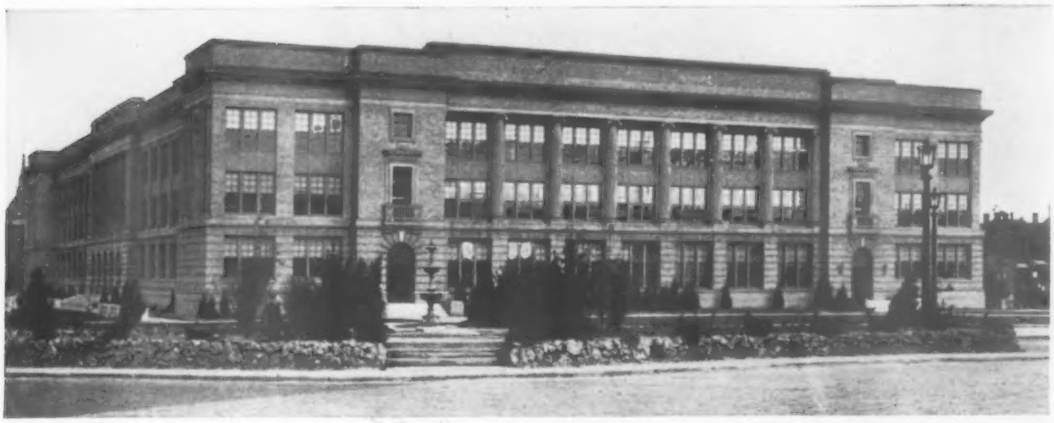
The fact that there are now less than twenty high schools of commerce in this country should not lead to the inference that there is little demand for public school classes preparing for commercial occupations. On the contrary, the number of high school pupils enrolling in commercial subjects grows larger each year at an ever increasing rate. Probably in all our cities never less than one-third of the total number of the high school pupils are preparing for employment in offices and stores. In Philadelphia this year, 47 per cent of all the secondary school pupils were found to be taking commercial courses; this percentage is likely to be equaled in all the large cities. Even in rural states and towns the enrolment in commercial subjects is surprisingly large, often exceeding one-third of the total high school enrolment. Perhaps the most significant evidence of the popularity of commercial subjects is to be found in the fact that the number of high school pupils taking these subjects is larger than the total number of young people of similar ages enrolled in all the other practical high school courses combined—including agriculture, home economics and industrial courses.

College Preparatory Influences Dominate

The popularity of commercial occupations as an objective of a high school education has not, however, resulted in the development of a different kind of secondary school education. Commercial school programs have developed primarily by the *addition* of commercial subjects, rather than by the reorganization of the venerable academic curriculum. Some phases of English, mathematics, languages, and the physical and social sciences are of undeniable value to young people in commercial employments; yet even in high schools of commerce no satisfactory correla-



THE SAMUEL J. PETERS BOYS' HIGH SCHOOL OF COMMERCE, NEW ORLEANS, LA.



THE JOHN HAY HIGH SCHOOL, CLEVELAND, OHIO
This school is a high school of commerce, although not in name

tion of these academic subjects has yet been worked out with a view to making them contribute to an effective preparatory education for business.

One or two of the high schools of commerce have offered for a short time commercial curricula including commercial English, commercial mathematics, industrial and commercial history, economics, and other general subjects whose teaching content was especially selected to contribute to an integrated understanding of commerce. None of these special courses, however, seems to have long withstood the pressure of college-trained school administrators for subjects recognized for entrance credit by colleges and universities. Consequently, most high school commercial curricula today are an incompatible *mariage de convenance* of college-preparatory academic subjects and commercial subjects with a business college ancestry.

The chief reason for the general failure to develop the special commercial curricula needed for the efficient training of young office and store employees has been educational conservatism and lack of business knowledge on the part of high school principals and occasionally school superintendents; for few of even the high schools of commerce are in charge of principals or assistant superintendents who have had a background of business experience or commercial education.

Conventional Buildings Provided

High schools of commerce, whether the term is applied to the few schools which have this as their special name, or whether it means the large number of high schools most of whose pupils are enrolled in commercial courses, are not, as far as the appearance of their buildings is concerned, markedly different from any large high school. Because the learning activities in a secondary school preparing for office and store work

THE RECENTLY COMPLETED HIGH SCHOOL OF COMMERCE, PORTLAND, ORE.

REAL CUSTOMERS PARTICIPATE IN A CLASS IN RETAIL SELLING

are not radically different from those used in a college-preparatory high school, a special design or layout is not required. The new Portland, Ore., High School of Commerce is not essentially different in appearance from the recently occupied school of the same title in Providence, R. I., or from the John Hay High School in Cleveland, which is almost exclusively a commercial school. The exterior of the Samuel J. Peters Boys' High School of Commerce in New Orleans, with its beautiful entrance decorated in the Spanish style, gives no indication that the primary purpose of the school is to prepare for business.

Unfortunately, the particular provisions needed for the most effective conduct of many commercial classes have not been incorporated in the building plans of commercial high schools, for the same reasons that vocationally efficient commercial curricula have not been developed. Indeed, quite often academic high school principals have assumed that the teaching practices developed in the private commercial schools of a half-century or so ago were psychologically sound,

THE OFFICE MACHINE ROOM IN THE NEW HAVEN, CONN., COMMERCIAL HIGH SCHOOL
The room contains 35 machines of 14 different makes

JUNIOR HIGH SCHOOL PUPILS IN THE McCALL SCHOOL, PHILADELPHIA
They are being taught how to prepare packages for mailing and how to do the work required of shipping clerks

and therefore they have often recommended for their own schools the large bookkeeping and typewriting rooms used in private business schools as a revenue-producing convenience.

Unusual Features Needed

These same administrators have also failed to ask for the particular features needed in certain

A COMMERCIAL CLASSROOM EQUIPPED FOR GIVING INSTRUCTION IN THE OPERATION OF CALCULATING MACHINES
Note the specially designed desks for classroom use

classrooms for the efficient teaching of commercial subjects. The special kinds of lighting facilities required in typewriting and office appliance rooms, the specific features needed in classes wherein salesmanship is taught, and other appropriate room-modifications, are conspicuous by their absence in the schools wherein commercial subjects are most generally taught.

For example, the space beneath blackboards is ample for the built-in file drawers needed in typewriting, shorthand, commercial geography and bookkeeping rooms; yet few schools offer these conveniences, largely because the academic school administrators did not recognize the need for them. Typewriting and office appliance rooms are not generally provided with washstands, or with windows which give all-day-long indirect (ceiling reflected) light, to eliminate shadows and uneven illumination at the typewriters and other machines farthest away from the windows.

Lack of Space Provisions for Special Activities

Provisions for school banks, school bookstores, offices for keeping the financial records of extra-school activities, large school administrative offices, ticket-selling spaces, and cafeteria-cash-register enclosures, adequately planned to permit the use of all these places as laboratories in which a valuable kind of business experience can be acquired under supervision of the teachers, are very seldom found even in the best schools. Indeed, all of these special features are not to be found in any one school. From these examples it is evident that there is much room for improvement in the layout and planning of the classrooms and other places wherein learning activities can be carried on in high schools of commerce, and in the commercial departments of large high schools.

Students in School Administrative Offices

The size and equipment of the school administrative offices depend upon the use made of them. In every high school a large volume of clerical work is required in keeping attendance, supply, scholarship, cost, personnel, and other records. In many secondary schools, especially in the West, much of this clerical work is being done by pupils from the commercial departments. By assuming responsibility for the accurate and quick performance of certain kinds of office work, these students learn more about the real requirements in clerical work than they can from textbooks. The work is all done under the supervision of teachers. Sometimes the school clerk is a former teacher of commercial subjects who has been put in charge of the school offices and workers; in some schools an assistant recorder directs a corps of student clerks. Undoubtedly, as more high schools come to operate in accord with the theory that learning is most efficiently done when based upon purposeful activities, they will provide better facilities for having the record-keeping and clerical work of the school done by the commercial students.

A CLASS IN OFFICE PRACTICE IN THE SAN PEDRO HIGH SCHOOL, LOS ANGELES, CALIF.
This class keeps the financial records of the school cafeteria and all extracurricular activities

Electric and Telephone Circuits Important

As many office appliances are electrically operated, provision should be made in the design of a new building for the outlets necessary. Since

THE STUDENT SUPPLY STORE AT THE LOS ANGELES, CALIF., HIGH SCHOOL
The commercial department operates the store, which sells several thousand dollars' worth of merchandise a term

it is more economical to install circuits and outlets when the building is being constructed than to put them in afterward, all offices and rooms to be used in the teaching of commercial subjects should be well supplied with service outlets for all the kinds of commercial appliances operated by electricity which are now being introduced into the public high schools, from typewriters to cash registers.

Provisions should be made for telephone circuits also; the necessity of giving instruction in the proper use of telephones, including P.B.X. boards, is now conceded. For worthwhile instruction, telephone sets and boards actually connected with a listener are necessary. The expansion of more radio programs into the business field should also be foreseen in the equipment plans when a new building is designed, so that the class-

DICTATING AND TYPEWRITING MACHINES IN THE NEW HAVEN COMMERCIAL HIGH SCHOOL

THE OPERATION OF BOOKKEEPING MACHINES IN A CLASS IN OFFICE APPLIANCES AT THE HIGH SCHOOL OF COMMERCE, YONKERS, N. Y.

Courtesy of the Remington-Rand Business Service, Inc.

THE LIBRARY OF THE DE WITT CLINTON HIGH SCHOOL, NEW YORK CITY

BOOKKEEPING AND BILLING MACHINES IN THE JOHN HAY HIGH SCHOOL, CLEVELAND

rooms in the commercial department can be easily fitted to utilize any special vocal and television broadcasts on subjects relating to business.

Equipment for Salesmanship Training

From present indications it is safe to assume that salesmanship as a preparatory training for retail store positions will be the next important addition to the commercial program of the public high schools. For the efficient teaching of these activities, a special kind of equipment is needed, such as that found in the Technical High School of Omaha, Nebr. Here two classrooms have been fitted up with counters, shelving, movable aisle-display cases, show windows opening upon the school corridor and one opening upon the street. The usual equipment of a grocery store is in one room and that of a dry-goods store in the other. Chairs are placed here and there in these rooms for the convenience of the students, but in neither of them are there school seats, in the usual sense, or other features of an ordinary

THE FILING ROOM OF THE JOHN HAY HIGH SCHOOL

classroom, although a portable blackboard is available. In addition there are stock rooms, such as small stores might have, and also a small office.

At stated hours sales of goods are made in these stores to pupils in the school. Demonstration sales are realistically staged, and window dressing is well taught, with the best displays often shown to the public in the show-window opening on the street. At times products of the school shop are displayed here by the pupils in the window-dressing classes. The entire equipment suggests business rather than a school, which would seem to be exactly the atmosphere for a school giving useful preparation for store positions.

Retail Store Laboratories

Some of the Western high schools have well-equipped school bookstores and school candy shops, which are managed and operated by pupils under the supervision of the teachers of salesmanship. In a building carefully planned for the teaching of selling and related subjects, all these kinds of facilities should be provided and so placed as to be convenient to the pupils of the school who will patronize them and to those who will serve in these retail store laboratories.

Accommodating Fixed Equipment to Size of Pupils

The special furniture and room equipment needed in the teaching of commercial subjects has received much attention on the part of school administrators and equipment manufacturers, so much so that there are almost as many kinds of typewriting and bookkeeping desks and similar equipment as there are schools. The outstanding requisite in all these kinds of fixed equipment is proper accommodation to the physical size of the pupils. Chairs and desks not suited to the leg and body length of the individual students are the outstanding characteristic in most commercial classrooms.

Desks and chairs need not be so readily adjustable that they can be changed each teaching period; pupils can be seated according to their physical needs rather than by the alphabetical order of their names. When pupils are seated by size, then chairs and desks of different heights only need be available; but they should be so made as to permit a change in height two or three times a year without great effort. There is nothing to indicate that swiveling, castor-mounted chairs are better than plain chairs; but there is much evidence to show that chairs which support the small of the back are superior to those which pretend to support the shoulders.

Considerations in Selecting Tables or Desks

In selecting tables or desks for typewriting, shorthand and bookkeeping classes, consideration should be given to both their purchase cost and the amount of space they occupy. Thus, drop-top typewriting desks are sometimes selected because they can be used by shorthand students taking dictation. But this type of desk is expensive both because of the amount of floor space it occupies and also because with these desks costly typewriters are locked up when the shorthand class is using the desks. A less expensive typewriting table with typewriters set less than two feet apart would permit the placing of more typewriters in the same area, while programming the shorthand class for an appropriately equipped room would enable the typewriters to be used by more pupils. Rigid typewriting desks or tables are essential, but not individual desks or tables, except in an office practice class.

The Problem of Mechanical Appliances

The rapid introduction of different kinds of mechanical appliances into business offices has forced the public schools to offer instruction in the operation of these machines. The equipment of these rooms presents some problems that school administrators need to consider carefully. The machines and devices whose operation is to be taught in the commercial curriculum should be only those most widely used in the community in which the pupils of the school find employment. In other words, the opportunity for employment in the neighborhood as operators of a machine should be known to be numerous enough to provide employment for all those trained, while machines not extensively used in the community should not be selected. A survey of office appliances used in the community by beginners is often advisable in order to get the accurate information necessary for an intelligent choice of appliances.

Radical Improvements Needed

Space does not permit a detailed account of how a high school of commerce or a large commercial high school should be planned and equipped when viewed as an efficient place in which to prepare youth for commercial employments. But there is abundant room today for an almost revolutionary type of school and school building.

Equipment for Secretarial Practice Classrooms*

By PAUL S. LOMAX and JOHN V. WALSH
New York University, New York City

AT the end of high school business training, it is necessary to bridge the gap between school classroom and office situations. The course in office practice is thus a transitional course. It is comparable to the model teaching class in a teacher-training institution, to the hospital experience of a medical student, or to the pleading practice conducted by law schools after the theory has been learned.

Of course, the office practice room cannot be an actual office, for by its very nature it is merely a training room or a training office. It should, however, approximate an actual office as far as the building equipment permits and the budget provides. Only in this way can the students be brought into an office atmosphere. It is impossible to teach office practice in a traditional classroom.

A large part of an office practice room will be occupied by desks, tables, stands and machines; consequently, the room should be considerably larger than the average classroom in a high school. In the academic classroom the student sits at one desk during the entire term; in the office practice room the students rotate from one machine or activity to another. The actual size of the room will depend upon the number of students whom it is planned to accommodate. Here, of course, we have a limit. It has been found by experience that it is not feasible to teach office practice to a class of more than thirty students. The reason for this is that the students are forced, through the scarcity of machines, to work in teams or groups under the constant supervision of the teacher, and the number of groups which he can supervise is limited.

The room should be well adapted to the arrangement of office machines. An excessively long office practice room places an unnecessary burden on the teacher in presenting work to the entire class.

Desks

The desks used in an office practice room should be larger than the desks provided in an academic classroom. Frequently a student has two or more large reference books open on his desk, or he may require an office machine and a record book in which to enter the results of his computations. The desks should have flat tops and should measure about 24 x 30 inches. They should be fixed to the floor; and, as the adjustable feature has not been found practicable, it is best to provide desks of various heights. It is not necessary to have inkwells.

While it is necessary to have several typewriters in a strictly office practice room, experience has shown that it is wasteful to provide each desk with a typewriter. Not only would this require an added investment, but the drop-top desk to which the machine would ordinarily be attached would take up too much room. Consequently, we recommend that the office practice room contain six typewriters, attached to drop-top desks. One of these typewriters should be provided with a long carriage. Furthermore, the

* Adapted in part from the authors' book, "Problems of Teaching Shorthand," Chapter X. Prentice-Hall, Inc., New York, 1930.

typewriters should be of various makes, including the noiseless. If space is limited, typewriter tables may be used instead of drop-top desks.

The desks may be provided with drawers. Thus each student assigned to a given desk during the day may have a locked drawer in which to keep his materials—pencils, ruler, blotter, pens and blankbooks. The plan of rotating from one part of the room to another, however, makes this arrangement inconvenient. If drawers are not provided, a cabinet plan, described in a later paragraph, should be installed.

Chairs

The chairs should be comfortable and movable. The experience of many teachers with adjustable chairs has not been satisfactory. Both the height of desks and that of chairs may be varied, the chairs being sixteen and eighteen inches in height. The average sturdy chair, provided with rubber feet, has been found most suitable.

Cabinets

As suggested, the practice of assigning a drawer in the desk to each student has its limitations. A more convenient method of providing for students' materials is to furnish cabinets in which each student has a tray similar to the wooden or wire desk trays seen in modern offices. The arrangement of these cabinets depends entirely upon the plan followed in teaching the classes; for instance, the first class that appears in the morning may have the first cabinet assigned to it, the second class, the second cabinet, and so on.

Teacher's Furniture

The teacher should have a modern flat-top desk of the type usually provided for executives in business offices. With this should go a swivel chair. Near the desk should be placed two extra chairs, a long table about 9 feet by 2 feet 6 inches for reference books and demonstrations, a filing cabinet for actual business letters, office practice records, examinations, plans, mimeographed forms and questions, problems, projects, and practice letters for filing, and a cabinet or closet for office supplies.

Blackboards

The blackboard which is found in the ordinary classroom may be suitable for use in an office practice class. It is not necessary, however, to use so much blackboard space. A sliding or swinging blackboard will save a great deal of wall space and thus add to the office-like atmosphere of the classroom. The front section may be a bulletin board.

Supplies

Each student should have several pencils, a fountain pen, a ruler, a blotter, a shorthand notebook, a pad of plain paper and a pad of ruled paper. A pencil sharpener should be placed in a convenient part of the room, and the usual classroom equipment which accompanies the blackboard should be present. An ample supply of business forms of various kinds should be at hand at all times, including invoices, bills, statements, checks, drafts and trade acceptances.

An outfit of individual filing equipment should be provided. This furnishes the materials necessary for group practice in filing. There should be a reserve supply of filing guides and folders, as well as of index and library cards, and an adequate supply of telegraph and cablegram blanks.

Mechanical Devices

The day of teaching office practice without teaching the use of office machines is past. As a matter of fact, office practice today means essentially the machine way of doing office work; consequently, the office practice classroom which lacks modern office machines is entirely inadequate.

Duplication Machines

A common phase of office work is the duplicating of letters and notices; hence, young people who are about to enter a business office should be familiar with one or more of the processes of making copies. There should be at least one machine that makes use of the stencil method of duplication, one that employs the gelatin principle, and one that uses the roller copier method of duplicating. The machine installed in each case should be the very latest model, as practice with an obsolete model is really waste motion.

Switchboard

Near the door of the room there should be installed an information desk and a cord telephone switchboard with several extensions. The atmosphere of the office is served by such an arrangement by emphasizing both switchboard and telephone practice. The cord switchboard is preferable to the monitor or key switchboard, as the service of the latter is limited. If a student is learning to operate a switchboard, he should learn to use one which gives maximum service.

Adding and Calculating Machines

Adding and calculating machines are in such general use that it is desirable for a modern office practice room to have at least one machine of each type:

1. Non-listing machines
   a. Key-driven
   b. Non-key-driven
2. Listing machines
   a. Full keyboard
   b. Ten-key

While it may be desirable to have a battery of the key-driven machines, the cost is usually pro-

hibitive; hence the equipment is limited to four different makes of machines, one of each of the types described above.

Machines Used in Connection with the Mail

Some of these machines are very expensive; hence our list here will be confined to the less expensive machines, such as a stamp affixer, an envelope opener, date and time stamps, and scales for the weighing of packages.

Dictating Machines

There are two well-known dictating machines on the market. At least one complete outfit of one of the machines should be purchased. This includes the dictating machine, the transcribing machine, and the shaving machine. If all three units cannot be purchased, the shaving machine may be omitted, or one machine can be bought in which the dictating and transcribing units are combined.

Shorthand Machines

There are two machines on the market that aim to take the place of manual writing of shorthand, and whose use seems to be growing. A demonstration each term by the manufacturer is recommended for schools whose funds do not permit purchase of the equipment.

Miscellaneous Equipment Needed

Mail trays
Paper cutter
Stapling machines
Ink eradicator
Supplies for cleaning typewriters, and mimeograph or other stencil machines

Reference Books Needed

Three dictionaries, one of them unabridged
Postal Guide
Railroad Guide
World Almanac
Atlas
Gazetteer
Express and freight guide
Newspaper guide
Credit rating book
Cable code book
Books on secretarial practice
Books on office organization and management
Office Equipment Digest

Magazines

At least one monthly magazine devoted to office practice or to office management should be subscribed for.

REMINGTON RAND BUSINESS SERVICE, INC.

Remington Rand Building, Buffalo, New York

Remington Typewriters
Dalton Adding Machines
Remington Accounting Machines
Remington Rand Steel Shelving
Library Bureau Library Equipment

Branches in All Principal Cities

Safe-Cabinets
Kardex Visible Records
Kardex Teaching Outfits
Library Bureau Files and Systems
Library Bureau Practice Outfits

ADMINISTRATIVE EQUIPMENT

If space saving is the factor you must consider, there is Remington Rand equipment specially for saving office space. If speed of maintenance concerns you most, Remington Rand record appliances are offered you in more than a hundred practical arrangements for speed. If accuracy is paramount, Remington Rand has methods of checks and automatic proofs which assure positively the rightness of the work you do.

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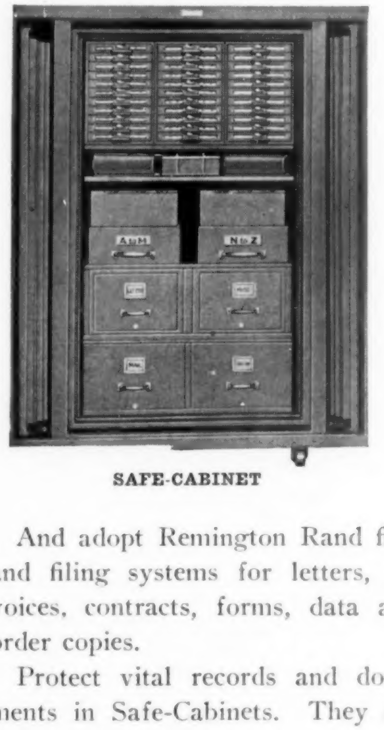

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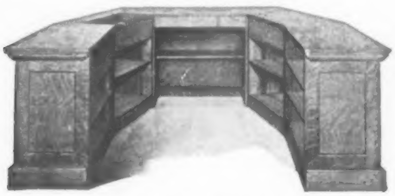

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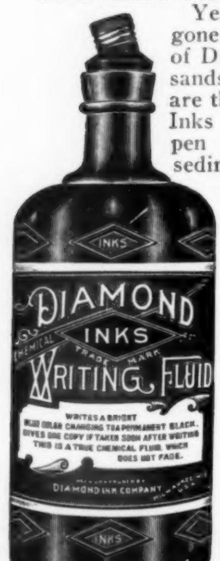

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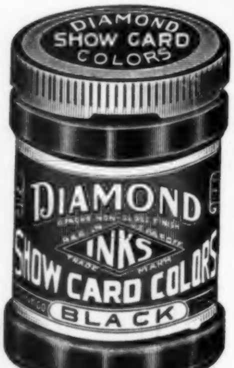

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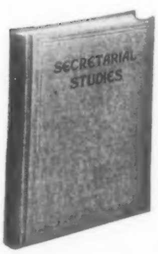

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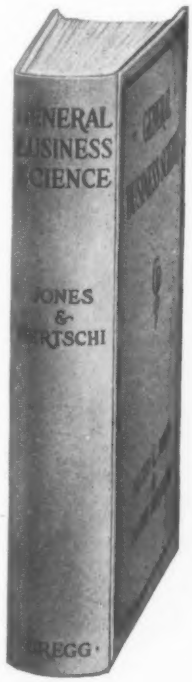

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CAFETERIA—DORMITORY—INFIRMARY

Management and Equipment of School Cafeterias

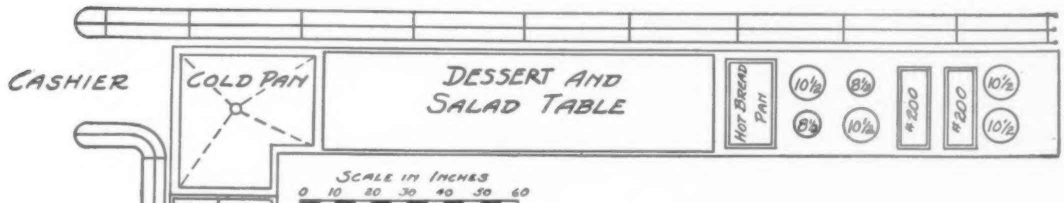
The Experience of the Pasadena Cafeteria Association

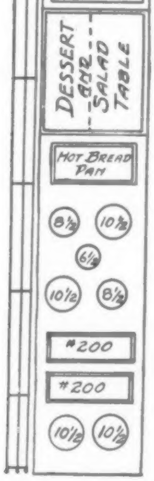
BY HENRY G. LEHRBACH
CONSULTING ENGINEER; FORMERLY SECRETARY AND BUSINESS MANAGER, BOARD OF EDUCATION, PASADENA, CALIF.

THE school cafeteria is generally accepted as the most satisfactory arrangement for providing pupils with a warm lunch at noon. High schools and junior high schools have for several years included cafeterias among their facilities because the daily school programs are practically continuous and pupils do not have time to go home for lunch. A number of school boards now feel that they should include provisions for cafeterias in their elementary schools also.

When cafeterias are installed in all the schools of a city system, efficiency and results satisfactory to the children, parents, school authorities and taxpayers must be secured. These results are possible only when cafeterias and noon lunches are considered by the Board of Education as a problem of administration for the system as a whole.

THE PUPIL SIDE OF THE STEAM TABLES AND COUNTER IN A PASADENA HIGH SCHOOL CAFETERIA



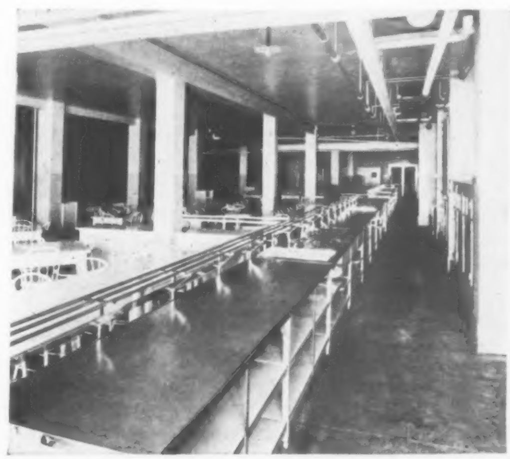


DETAILS OF THE SERVING TABLES USED IN PASADENA SECONDARY SCHOOL CAFETERIAS

School Cafeterias Authorized by State Law in California

Although many states have not yet taken official cognizance of the practice or desirability of providing meals in the schools, California in 1927 gave special attention to the needs in this regard. A specific section of the School Law authorized the provision and equipment of school cafeterias from school-building funds. The law, however, made no provision for the operation of the cafeterias. In fact, the Legislature delayed the enactment of the law for two years until it was assured that no cost of operation, labor or food materials would be a charge against public funds. Since the law did not allow school systems to operate cafeterias as a part of their work, it was accordingly incumbent upon Boards of Education to arrange for their operation through other channels.

A definite policy regarding purpose must be established, whether an individual school or a city system undertakes to provide cafeteria facilities. School cafeterias may exist either to provide pupils with a warm lunch of wholesome food at a minimum cost to the children, or to furnish revenue for all kinds of activities needing financial assistance. The experience of the Cafeteria Association in Pasadena has demonstrated the fact that a non-profit-making organization can, through capable central management, operate school cafeterias effectively and efficiently.



THE SERVICE SIDE OF THE STANDARD STEAM TABLES AND COUNTER IN A SECONDARY SCHOOL

THE EATING ROOM OF A CAFETERIA IN A REMODELED SCHOOL BUILDING IN PASADENA

The Organization of the Pasadena Cafeteria Association

The voluntary Cafeteria Association was formed in Pasadena in 1925, and consists of the principal of one high school, the Director of the Child Welfare Department, a representative of the Parent-Teachers' Council, a representative designated by the Chamber of Commerce, and the business manager of the Board of Education. This group also constitutes the Board of Directors under whose guidance the cafeterias are operated. The Association through its Board of Directors employs a Director of Cafeterias, who is also the Supervisor of

Dietetics in the Child Welfare Department, as the active general manager of the cafeterias.

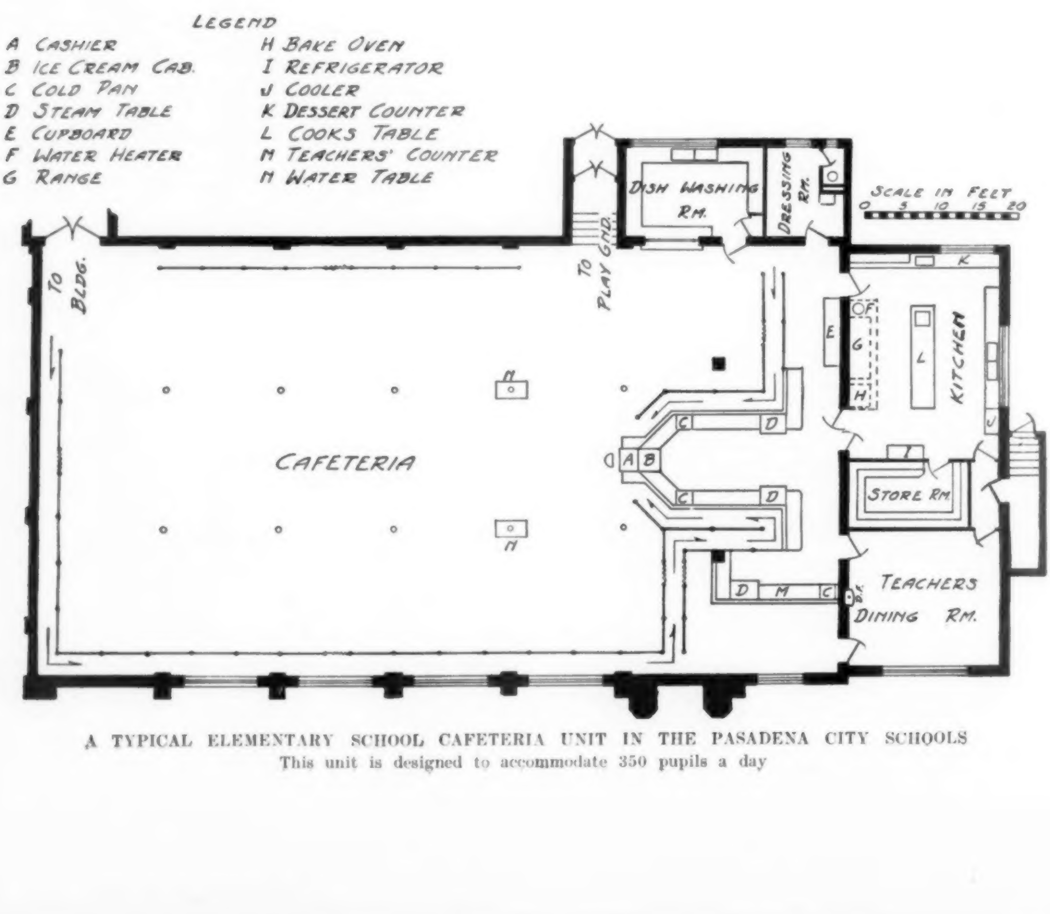
Because every member of the Association was vitally interested in securing the best service for the children, and since each one agreed to serve without direct or indirect profit to himself, the Board of Education granted the organization an exclusive lease to operate the 22 cafeterias in the Pasadena city schools. The lease stipulates that no food, candy, ice cream or other edibles may be served on school premises except through the Cafeteria Association. Such an arrangement makes it possible to provide good, wholesome food for the pupils without profit to any one or expense to the taxpayer. The cafeterias have also served as a means of educating the children in the choice of health-building meals, since the Director of Cafeterias also supervises the teaching of dietetics in the classrooms.

How the Association Operates

The Cafeteria Association began operations and has continued them exactly as a private corporation, except that it has been run without financial profit and has existed without subsidy from any source. The California law emphatically states that the food must be sold at cost, and defines cost as including all materials, labor and maintenance of the equipment.

The Director of Cafeterias in Pasadena was granted authority to employ help at rates established by the Board of Directors of the Association, and to enter into certain annual contracts for supplies, as well as local contracts for perishable foodstuffs. The policy was established that only the highest quality of food material would be purchased; that service by dealers would be recognized; that prices and menus in all schools would be the same; and that each school unit must be self-supporting.

A working manager is assigned to each cafeteria, and is responsible to the Director for the successful operation of that cafeteria. Success is considered to mean not only financial soundness but satisfaction to the children of the schools. High-grade assistants are employed, and careful checks are established to show the status of each cafeteria at the end of the week. All accounts for the Association are handled at the central office by an accountant. All orders are placed by the Director. A complete monthly inventory of all supplies is required of each manager, and the exact fiscal status of all cafeterias is reported to the Board of Directors at its monthly meeting. Careful check over six years of operation shows that a greater percentage of the Association's expenses of operation goes for food than in the case of either commercial establishments or school cafeterias operated in other parts of the country.



A TYPICAL ELEMENTARY SCHOOL CAFETERIA UNIT IN THE PASADENA CITY SCHOOLS
This unit is designed to accommodate 350 pupils a day

The Association Is Self-Supporting

A definite limit of 2 per cent is fixed by the Association as the maximum amount which can be expended for central administration. The Association carries complete liability and compensation insurance for all employees; it pays for all water, fuel, power and laundry, as well as the expense of maintaining the equipment. Student help is employed in junior and senior high schools, and is paid for in cash at an established hourly rate. The Director gives constant supervision to the management of the project. She has developed an enthusiastic and efficient organization which enables the Association to be entirely self-supporting.

The weekly menus for Pasadena schools are determined by the Director and published in the local newspaper. This enables parents to discuss school lunches with the children and to assist the Cafeteria Association in influencing pupils to make the proper choice of food for a well-balanced meal. The cafeterias serve on the average 6,903 meals daily, at an average cost of 15 cents. During a period of six years, approximately $950,000 has been handled by the Association. The difference between the total expenses (labor, materials and maintenance) and the total receipts is approximately two cents in three dollars.

The Location of the Cafeteria

There appears to be no uniform practice throughout the various sections of the country in regard to the location of cafeterias in school plants. The amount of floor space needed also varies according to the character and the organization of the school. Experience in Pasadena indicates that approximately 27 per cent of the average daily attendance of an elementary school, 53 per cent of a junior high school, and 64 per cent of a senior high school, patronize the cafeteria.

It should be remembered that pupils are in a cafeteria not more than twenty minutes a day. Therefore, when funds are needed for classrooms or for educational equipment, they should not be spent for elaborate quarters and equipment for cafeterias. All taxpayers are not enthusiastic about such innovations, and while the necessity for school cafeterias cannot be denied, any extravagance in connection with them should be avoided.

Many school buildings which were erected before cafeterias were considered essential can be remodeled to provide these facilities. When a new school plant is being planned, one of the three general locations is usually selected for the cafeteria. (1) If funds are available and conditions justify it, a separate building with a ground floor entrance is preferable. It should be so located as to be equally accessible from all parts of the school plant. (2) If the school plant contains a centrally located auditorium, the space beneath the auditorium will be found well adapted to cafeteria purposes, provided adequate light and air are available. (3) A number of school buildings are located on sloping sites so that space with outside windows, below the first floor, may be utilized. These locations are excellent, since they are nearly always adjacent to the playgrounds.

In certain communities it has been the practice to locate cafeterias on the top of school buildings. Even the original proponents of this location now acknowledge that it was a mistake. The problem of getting food supplies to the third or fourth story of a building, and the difficulty of moving the school population to such an inconvenient location, from which there is no access to the outside grounds, condemns the arrangement unless the school is patterned after a metropolitan office building or club.

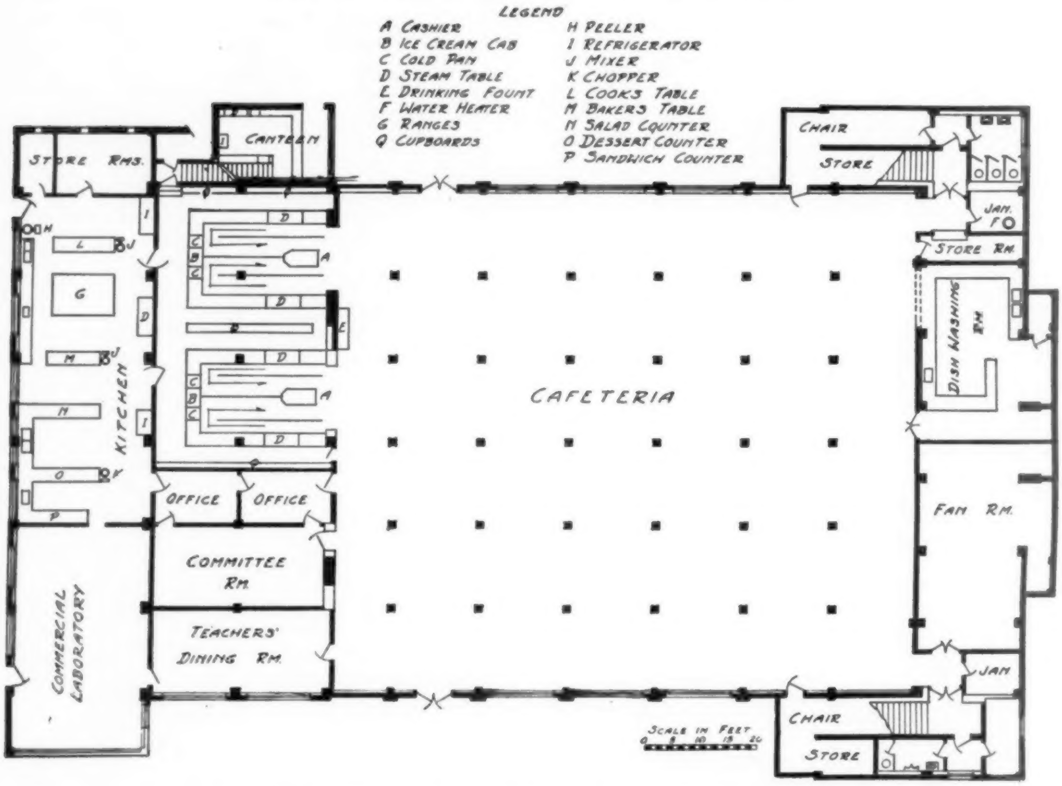
Eating Rooms Should Be Made Attractive

The eating room of the school cafeteria should be large enough to accommodate either half or all of the pupils, depending upon the type of school (whether high or elementary), as well as upon the organization of the classes. An "institutional" atmosphere should be avoided, and either long, narrow tables or square tables should be provided, at which groups may sit together and eat sociably. Light, good ventilation and cheerful surroundings are indispensable. The liberal use of color and decoration adds much to the attractiveness of dining rooms, and acoustical materials in ceilings and walls, as well as resilient floor coverings, are essential to minimize the noise in these rooms.

Planning the Kitchen

Only such kitchen equipment as can be used to economical advantage should be provided. The kitchen itself should be carefully planned with ample space for straight-line preparation of food. Separate sections of the room should be set aside for general cooking and for the preparation of salads, sandwiches and desserts, so that each portion of the work can be carried on without interference with the others. Modern kitchen ranges with hoods; a slicer, potato peeler, meat chopper and mixer; bake ovens and ample refrigeration, should be included in the equipment. When space conditions permit, one refrigerator should be located so that salads placed in it on the kitchen side can be removed from the opposite side and placed directly on the serving tables. Steam tables should be of ample size and convenient design because the steam table is the "bridge" between the kitchen and the dining room. If the design or size of the steam table is inadequate, the number of dishes which can be offered is limited, and the food cannot be kept hot.

All steam tables in use in Pasadena schools



A TYPICAL HIGH AND JUNIOR HIGH SCHOOL CAFETERIA UNIT
The entire kitchen and serving sections can be closed off to make the eating room available for other purposes

have monel metal tops; all inserts are of heavy white enamel; and all tables are heated by gas. All dessert tables have linoleum finish. The steam tables are designed to show hot dishes to the student first, and salads and desserts afterwards. This is the reverse of ordinary commercial practice and is done intentionally to encourage the purchase of hot lunches. The accompanying plans indicate how the serving tables are arranged in Pasadena schools.

Pasadena Profits by Its Experience with School Cafeterias

After they have finished their lunch, pupils in the Pasadena cafeterias carry their trays and used dishes to the dish-washing room. It has been found that these rooms are best located at the opposite side of the eating room from the serving facilities. In some cases trays can be left near the door when pupils leave the cafeteria to go to the playground. Clean dishes are returned to the counters on a special dish truck. Since there is no occasion for it, dishes never enter the kitchen.

School cafeterias know to the exact minute when the first customer will arrive and when the food must be ready to serve. Experience will also indicate the number which may be expected, as well as the likes and dislikes of the patrons. These factors must be given study. The cafeteria must provide adequate service if it is to secure and maintain the good-will of the pupils and teachers, which is the foundation of its success.

A Modern Cafeteria and Kitchen Layout

BY ROY SELDEN PRICE

TAYLOR & TAYLOR, ASSOCIATE ARCHITECTS

THE cafeteria in the Horace Mann School at Beverly Hills, Calif.,* has been designed for a double line of pupils passing from either end to the center of the serving counter. The serving counter is therefore equipped with twin steam tables, etc. For the comfort of the serving force, the floor of the serving space and kitchen has been built six inches lower than the cafeteria. The height of the serving counter is therefore convenient for children and does not necessitate excessive bending over on the part of the service force. The serving space is equipped with sliding doors so that it may be entirely separated from the cafeteria, as an attractive room for various special uses.

The kitchen has been designed not only for cleanliness and efficiency, but for hard wear. The pot sink, dishwashing sink, drain boards, etc., are of metal. The pot sink is without legs, resting simply on heavy steel angle brackets cast into the concrete wall. This not only is easier to keep clean but facilitates cleaning the floor under the sink. All the woodwork is of hardwood and all the metal work is of monel metal. The metal work would have been cheaper if galvanized iron had been used, but it would certainly cost considerably more over a period of years because of the frequent necessary repairs and replacements.

* See page 302 for a floor plan of the school.

The stove has been sealed in with metal at the base, at the back wall and at the top, so that no dust or grease can collect under it or behind it. A circulation of air has of course been provided underneath and behind the stove, by means of screened openings in the sub-floor and vent openings in the wall behind the stove.

The work tables are provided with tilting bins for floor storage, with overhead shelves, and with metal working tops. Air passing through screened ducts from the basement and out through the roof ensures positive circulation of air for a large cooler closet for the storage of vegetables. The shelves in the cooler closet are of heavy wire.

Since the half of the kitchen which contains the stove occurs in a one-story wing, it was possible to have a sloping ceiling plastered directly on the underside of the rafters, thereby creating a natural rise to exhaust the kitchen heat through the pair of grill doors at the highest point into the attic fan room and exhaust duct. The grease hood over the stove has been brought down to within 6 feet 6 inches of the floor, and is provided with a positive electric exhaust fan to withdraw the grease at the source. The kitchen is equipped with electric refrigeration, sufficient closets, cupboard drawers, etc., a dressing room and toilet for kitchen help, and a ventilated towel-drying closet.

THE CAFETERIA AND SERVING COUNTER, AND THE KITCHEN, OF THE HORACE MANN SCHOOL, BEVERLY HILLS, CALIF.

A Fireproof Dormitory at a Cost of $1,000 Per Resident

BY CARL REGER

ARCHITECT, MORGANTOWN, W. VA.

THE new wing of Agnes Howard Hall, the girls' dormitory of West Virginia Wesleyan College, is regarded by the administrative heads of the college as an outstanding example of satisfactory construction at an exceptionally low cost. The achievement, it is believed, compares favorably with that of the University of Oregon in its men's dormitory described in THE AMERICAN SCHOOL AND UNIVERSITY last year.*

West Virginia Wesleyan College, at Buckhannon, W. Va., is a coeducational school owned and operated by the Methodist Episcopal Church, with an average attendance of approximately 400 students, about half of whom are girls.

The original dormitory for girls, now known as Agnes Howard Hall, was built in 1894 and equipped with the limited facilities then in vogue, accommodating only about 75 girls. It became evident that additional space must be provided, and in the spring of 1928 the project was authorized. The architect, Carl Reger, of Morgantown, W. Va., received close cooperation from President H. E. Wark and Treasurer E. E. Stoffel, with the result that plans for a satisfactory addition were completed promptly. In June a general contract for its erection was placed with the John M. Kisner & Bro. Lumber Company, of Fairmont, W. Va. The building was completed and fully occupied in March, 1929, at a total cost of slightly less than $75,000, not including architect's fee. It has a capacity of 75 beds.

*See pages 406-409, edition of 1930-31.

AGNES HOWARD HALL, WEST VIRGINIA WESLEYAN COLLEGE
The new wing is seen at the right in this photograph

The Construction of the Building

The addition constitutes a complete wing built at right angles to the main axis of the old building. It is of fireproof construction throughout, except for wood rafters and sheathing for the main roof; these are, however, completely isolated from the rest of the building by a fireproof concrete attic floor. The outer walls are sandstone for the basement, and brick with structural tile backing for the upper stories. The interior is structural steel for columns and main girders, steel bar joists with 2-inch concrete for floors, and 4-inch hollow tile partitions. All ceilings are plastered on metal lath.

On each floor there is one opening into the corridor of the old building, protected by standard underwriters' automatic fire-doors. The main stairway is entirely enclosed to form a fireproof stair tower, isolated from corridors by means of self-closing fireproof doors. All stairways are steel with non-slip terrazzo treads and landings.

The Basement Floor

Owing to the outside grade, the basement story is largely above ground. The east end includes a dining-room with full-size windows on three sides, a high ceiling, and space enough to seat 200 persons, considerably more than the number of residents of the hall. The west end of the basement floor is given over to a well-lighted kitchen and employees' dining-room, as well as a pantry, a storage room and toilet rooms. The entire basement has a mastic floor over concrete, and the kitchen walls are lined with vitritile to the ceiling.

The First Floor

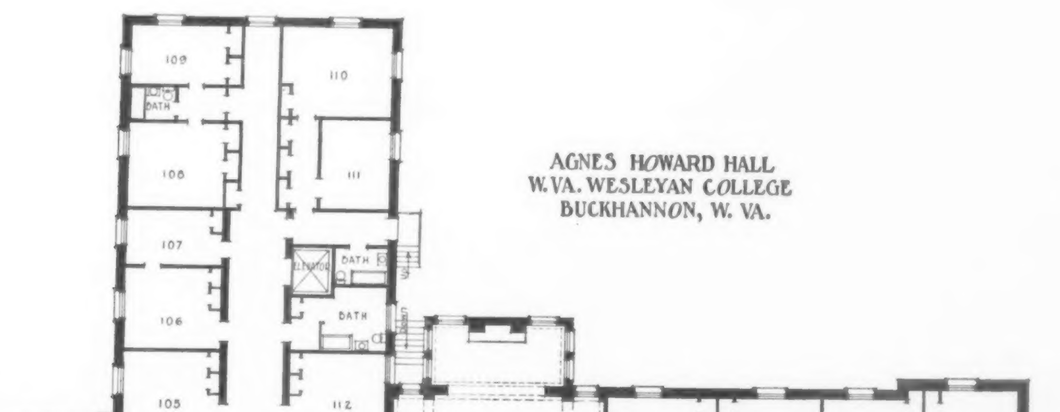
The main floor contains a large social room about 30 x 50 feet, adjacent to the smaller parlors of the old building, and large enough to more than accommodate all the occupants of the building. This is an attractively finished room with a high ceiling and a large open fireplace; all steam risers are concealed. This room and all bedrooms have waxed oak floors. The first story also contains a suite for the Dean of Women, a guest room, and several students' rooms. A

THE SOCIAL ROOM ON THE FIRST FLOOR OF THE NEW WING

wide, vestibuled entrance gives access from the outside to this floor.

The Upper Stories

The three upper stories are practically identical in plan, consisting entirely of rooms, baths and accessory facilities. After a thorough consideration, and an inspection of numerous other dormitories, the management of the college decided against the group bath-and-toilet plan of the old building, in favor of an individual bathroom between each two bedrooms. Since tub baths were easily accessible on each floor of the old building, it was decided to install showers generally in the new building, thus making it possible to maintain the desired room size with a somewhat shorter building. The final plan showed 19 bathrooms with showers only, and 4 bathrooms with recess tubs. Each bathroom has a terrazzo floor and base, a syphon jet closet, and a lavatory with a white steel medicine cabinet above. All showers are porcelain-enameled, with terrazzo receptors. This arrangement has proved highly satisfactory, providing one private bathroom for each group of four girls. The average room is 12 feet 6 inches x 14 feet, with two clothes closets, one ceiling light fixture controlled by a switch, one wall bracket, and two receptacles. Each bathroom has one outlet over the lavatory mirror and one receptacle.



The social room and rooms to the right of it are in the new wing. The kitchen and dining-room are in the basement. The second, third and fourth floors are occupied by bedrooms, suites being connected by bathrooms. On the fifth floor of the new wing is a tower room used as a sorority and association meeting place

Steam and Water Distribution

Steam for a two-pipe heating system is supplied from an outside central steam plant. The distribution system within the building consists of a concealed main riser to the attic, horizontal distribution in the attic, down feed risers through all stories to the basement floor, and return lines in a conduit under the basement floor to a receiver and pump. There are no exposed steam pipes in the basement or elsewhere in the building except for these small vertical risers.

All cold water lines of pipe are galvanized wrought iron; hot water lines are brass, with complete circulation back to storage tank. The cold and hot water lines also circulate in the attic, with concealed risers down to each stack of bathrooms, and separate valves on the bathroom supply lines. Steam lines in the attic and all brass water lines are covered.

The Electric and Ventilating Systems

The electric system is a complete conduit job, including service lines to supply both the new and the old building. This also includes a conduit for public telephone service to each floor.

An exhaust ventilating system with a fan in the attic provides ample ventilation for all bathrooms, toilet rooms, the kitchen, and other service rooms, including three small rooms on the upper floors equipped and used as kitchenette, hand laundry, and ironing room, respectively.

Unusual Features of the Dormitory

At the east end of the building a tower rises one story higher, about 19 x 40 feet in area. This is subdivided into space for sorority uses and includes an assembly room 17 x 26 feet, with a private stairway and suitable anterooms.

This dormitory was erected complete, ready for window blinds, lighting fixtures, and furniture, for the very low cost of 33½ cents per cubic foot, or almost exactly $1,000 per occupant, including the space reserved for guests and the Dean, and also including the large allotment of space for social room, dining-room, kitchen, and sorority room. The college administrative heads state that the new building is equal or superior to other dormitories they have seen which cost twice as much per occupant, and feel that they have achieved most satisfactory results for the money expended.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Exterior Building Material—Brick: Thornton Brick Co.
Flooring
Mastic Flooring—Thos. Moulding Floor Co.
Terrazzo—Pompeian Mosaic & Terrazzo Co.
Heating System—Warren Webster & Co.
Plumbing Fixtures—Bowers Pottery Co.
Roofing—Vendor Slate Co.
Sanitary Equipment
Toilets—Bowers Pottery Co.
Lavatories—Standard Sanitary Mfg. Co.
Showers—Fiat Mfg. Co.
General Contractor—John M. Kisner & Bro. Lumber Co.

The Laundry Problem of Schools and Colleges

BY ARTHUR H. ADAMS
CONSULTING ENGINEER; CONSULTANT TO THE TROY LAUNDRY MACHINERY CO.

NON-RESIDENTIAL schools and colleges have a simple laundry problem, restricted generally to towels and athletic garments. With no other reason for laundry equipment, it is normally cheapest and best to carry an adequate supply of towels, linen, etc., and to contract with a commercial laundry for their washing. This is true even in rural districts where the nearest good laundry is at a distance.

School-owned gymnasium suits, bathing suits, etc., may be handled in the same way, except that either daily collections of very wet or sweaty articles must be arranged, or else a small washer for rinsing, a small extractor, a dryer of some sort and a sorting table must be provided for those articles whose condition (especially in warm weather) will cause mildew and other damage if they are held longer than a few hours.

The Problem of Athletic Wear in Gymnasiums

Student-owned athletic wear in gymnasiums is more of a problem. Students exercise till the last bell rings, dress in haste, perforce stuff their perspiration-soaked and dirty sweat shirts, shorts, etc., into their lockers, and run. If no school laundry plant exists, three or four days usually elapse before articles that the student may eventually send away can be returned. He usually will not buy duplicate garments.

To improve conditions, there must be a rigidly enforced marking system for student-owned garments, a handy chute or bin, and an absolutely certain return to the student's locker of his garments, clean and dry, before the next day's exercise period. Arrangements may perhaps be made with a laundry for daily evening collections and for returning the clean garments by the next noon, to be at once distributed to the lockers by the attendant. Failing this, sanitation requires the installation of the tiny laundry plant described above. This should be near the locker room and will take only a few hundred square feet. A source of hot soft water and adequate drainage is available in any modern gymnasium.

If after every usage athletic wear is thus put through the laundry plant, a very light suds or even a mere warm rinse, extraction and drying will keep it in condition. The locker attendant, or any capable person, can be quickly trained for the

work. While the small plant will stand idle most of the time, so does a bathtub. It will pay its dividends in saving the students' garments from odor, mildew, discoloration and short life.

Residential schools and colleges usually have the same problems of towels and gymnasium wear, and the solutions are the same. No special technical problem is involved, even when a school-owned plant is decided upon. Laundry planning should not be undertaken by any institution without the aid of a competent engineer, but school ownership as such imposes no novel physical conditions to be reckoned with.

Satisfactory Laundry Service Needed in Residential Schools

The residential school's first and main problem is to effectively gear the available laundry service into the life of the students. I dare state that in most residential colleges, and in some of the less paternalistic residential secondary schools, where the student is expected to send out his own laundry, he seldom sends it. By this I mean that, when left to the student, regularity in disposing of dirty clothes, if the rule, is at least much honored in the breach. Should any school executive doubt this, an inspection of a few dozen students' rooms some time in mid-term should convince him.

The constant presence in one place, not specially prepared, of piles of dirty clothes (our hotels have discovered it) tends to the multiplication of bacteria, mildew, and vermin particularly in older buildings. The remedy is not discipline, but facilities.

Chutes, Bins, Cupboards or Hampers Necessary to Improve Conditions

Students have no desire to hoard soiled clothes. But school and college life opens to them so many new doors of interest that the routine mechanics of living, such as sending out the wash, does not and should not command their time. The right way should be made the easy way. At some expense in existing buildings, convenient laundry chutes or bins or cupboards, of sanitary and vermin-proof design, can be put into every room or entry. In buildings being planned, the school administrator and his architect should consider this facility in the class with other sanitary needs.

A chute for each room is desirable, lined with rustless metal, smooth, without jogs, fireproof, seams tight and vermin-proof, well ventilated, with a top-hinged, self-closing, fireproof, inward-swinging door at the student's end, and an outward-opening, self-closing locked door at the foot, with a grating to keep the pile of clothes some inches off the floor. Other much cheaper arrangements can be made, for example, wall cupboards or bins opening into the room and on the corridor; even suitable metal-lined or fiber hampers may be provided. The primary fact is that the student needs a handy and sanitary place into which to throw his dirty clothes. That simple act should end responsibility on his part. At home, at his club in later life, he does no more than that, and his apparel and linen come back all fit to wear.

A FEW OF THE FACTORS TO CONSIDER IN MAKING PRELIMINARY PLANS FOR A SCHOOL LAUNDRY

1. **The volume and character of the laundry work to be performed.**
2. **The amount of floor space ultimately required for the laundry plant.**
3. **The type of building that may house the plant.**
4. **The need of large supplies of soft, clean water, both hot and cold.**
5. **The cost and difficulty of installing adequate steam piping to and from an existing boiler.**
6. **The necessity of an adequate drainage system.**
7. **The availability of power.**
8. **The relation of weights and live loads of laundry equipment to floor loads, if more than one floor is contemplated.**
9. **The means (whether electric, hand or gas truck) to be used for the delivery of soiled linens from the collection points to the laundry, and of finished work to the dormitories.**
10. **Ventilation arrangements, regarded from three aspects: clean air for clean work; the frequent change of air for health; and the exhaust of vitiated air without creating a nuisance.**
11. **Clearances and means for moving in and out large units of machinery without excessive cost or risk of damage.**
12. **Employees' facilities, such as rest and toilet rooms, and in some cases the problem of separate gates or entrances for employees.**
13. **Methods of handling materials and the influence of the methods adopted on the assignment of floor space.**
14. **Arrangements for receiving and storing supplies.**
15. **The effect on the location of the laundry of plans for the future growth of the institution.**
16. **The possibility of damage or annoyance to laboratories, classrooms, etc., from laundry lint discharge, and also from laundry machinery vibration.**

A "Primary Collection" Service Recommended

In addition to an architectural facility, a service facility is thus required if the laundry is to serve the student fully. I may term this service facility the "primary collection," to distinguish it from the laundry truck collection. It must be a trusted service, preferably by school-paid personnel (e.g., the janitor), and its function is that of a maid in a well-to-do home—to collect, count, list and

bundle the laundry from each room, to keep copies of lists, to deliver the dirty bundles to the laundry truck, and to receive the clean ones and distribute them to the rooms. This service intervenes between the student and the laundry. It will inevitably have to mediate in claims. It cannot be performed by a laundry employee. Self-help students in some cases may perform it.

The school or college arranging for reliable "primary collection" service and providing the necessary architectural facilities will have solved its worst laundry problem. A suitable arrangement in most cases will be made, of course, with the best local laundry for the actual work. Some specially conditioned institutions, usually those in the country, may find it possible to give the student body better and cheaper service with a school-owned plant. Whether or not any given school should install its own plant involves a practical study in laundry economics.

Factors to Consider in Contemplating a School-owned Plant

One big handicap must be faced in most cases, aside from the usual circumstance that available funds are needed for other purposes. I refer to the seasonal load. The usual school laundry shuts down about four months in the summer. A difficult labor problem is thereby created, particularly as to the more expert and responsible help, and practically a full year's overhead must be loaded on eight months' output. The commercial laundry in a small college town is likely, however, to be in somewhat the same predicament. In a larger town, or near a large city, a school will for this one reason usually find it cheaper to make a contract with a good commercial laundry.

An educational institution of the campus type may, however, find that certain conditions offset this handicap. Such an institution will usually have its own boiler room, generally its own water supply, and often its own power plant. It may have available land that can be used as a laundry site with no additional outlay, or it may be able to house the plant in the existing boiler house or in an adjacent building. These items may save from 15 to 30 per cent of the initial investment. A labor saving will be effected if the power-plant personnel need not be increased to provide the laundry with hot water, steam and power, and with steam and water line maintenance.

Other advantages lie in the extremely even and predictable volume of work and the short-haul deliveries and collections. Self-help student labor may be utilized in the collection and delivery to buildings, in the "primary collection" and listing service above urged, as well as in bookkeeping and claim-adjusting. In coeducational colleges, darning, mending and marking may be done by self-help girl students. On a small campus, delivery trucks may be dispensed with, or at least fewer trucks used than for a commercial establishment of equal size. There will be no need for highly paid drivers to combine business soliciting, complaint receiving, bill rendering and bill collecting with bundle handling.

Cost Savings Possible

Power, fuel and water cost savings should be possible because the laundry load comes when the campus heat and power (lighting) loads are least. This last fact, added to the power-plant labor saving mentioned above, may save from 2 to 4 per cent on gross business. Educational institutions may be wholly or partly tax-exempt, and the laundry plant should receive this exemption.

The school-owned or -financed laundry opens possibilities of customer participation in profits akin to those of many university stores and other student mutual activities. A student who would resent pressure to use an official laundry plant, will readily enroll and participate in a profit-sharing laundry set-up, paying fair prices and cooperating heartily, because at the end of each term he will receive, after perhaps a bonus percentage to the manager or foreman, a pro-rata share of income beyond costs. Costs would cover, naturally, besides water, heat, power, supplies and labor, a proper amortization, and fair interest on the true added school investment.

The profit-sharing set-up should increase goodwill, decrease claims, abolish all agents' commissions and advertising, permit savings in pins and pinning, shirt-cards, collar buttons and fancy packaging generally.

No general rule can be given for determining whether a school or college should install its own laundry plant. Where the tilt of the economic balance is not clear, any experienced laundry engineer, after being supplied with certain facts by the school and after a brief survey of the community, could prepare figures that would either decide, or assist greatly in deciding with certitude, the question of school ownership.

The New Infirmary at St. George's School

HOWE AND CHURCH, ARCHITECTS, PROVIDENCE, R. I.

THE new Infirmary at St. George's School, Newport, R. I., conforms to the early Georgian character of the other buildings of the school. The Infirmary lies on a slope 90 feet to the east of the present dining-hall. The latter is on a grass bank 8 feet high. Since food must be brought in by hand truck, a connecting cloister is planned to ramp slightly from the first floor of the present kitchen to the second floor of the Infirmary. The boys in the school also approach to the second floor from an extension of the existing bank, while a new drive at the present grade on the north affords access for service to the lower floor.

On the second floor at the entrance are the services for the daily sick call, waiting room, dispensary and treatment room. Beyond are the head nurse's rooms, diet kitchen, dining-room, solarium with fireplace, and beds for eleven non-contagious patients, divided into single, double and quadruple rooms.

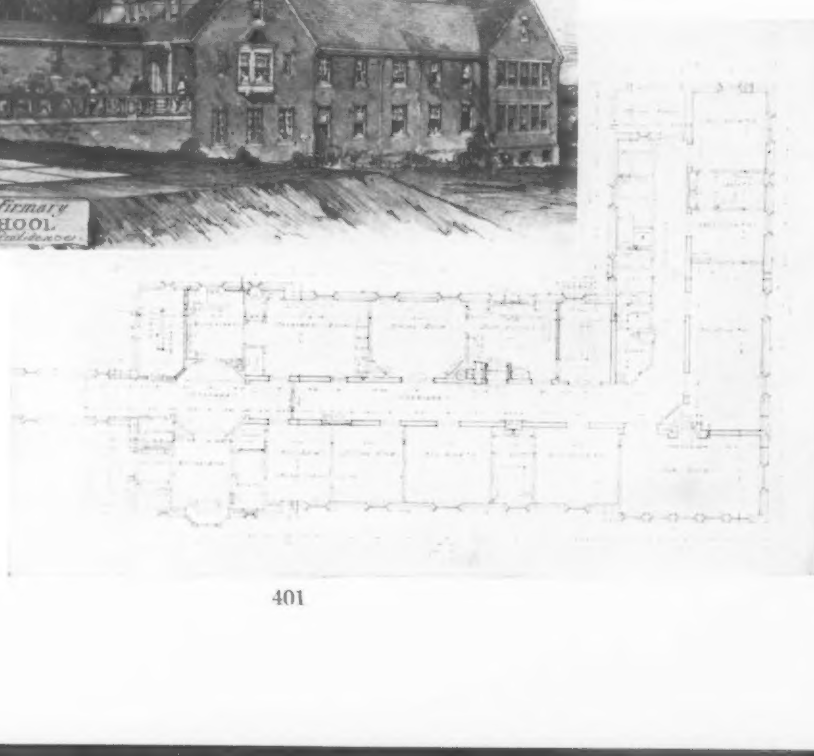
The first floor forms the contagious ward. It also contains rooms for the assistant nurse, two special nurses, and fifteen patients, a solarium and diet kitchen. Food is sent from above by a dumbwaiter, which also runs to the basement and is opened either from the kitchens or from the corridors. The basement contains a dentist's office, the heating plant, unassigned play space, laundry and storage space. In the third story are two maids' rooms and bath.

In a boarding school where pupils live in close proximity, epidemics of one disease or more are likely to develop. It is necessary to have a flexible arrangement so that different cases may be kept separate. The architects have tried to accomplish this end without useless duplication of corridors or baths. All patients' rooms but one are on the east or south. Each floor has an airing porch. In each patient's room is a small closet for his clothes.

Since the school is situated near a city, it has not been necessary to provide operating or X-ray equipment. Most of the laundry is likewise sent out. Soiled linen is dropped to the basement through a chute. Clean linen is easily distributed to the two main floors from the basement by means of the dumbwaiter. On each floor are adequate linen and utility closets. The building is heated by hot water. Ranges, refrigerators and sterilizers are operated by electricity, and there is a complete system of electric signals. An incinerator provides for disposal of garbage and dressings.

The walls are 12 inches deep, made of brick with an air space. The interior partitions and joists are wood except over the heater room. Floors are linoleum and asphalt tile. Window-sills are limestone, while frames and trim are wood.

The cost of the building complete is 53 cents a cubic foot, or $3,840 per patient.



AN ARCHITECT'S DRAWING AND THE SECOND FLOOR PLAN OF THE NEW INFIRMARY AT ST. GEORGE'S SCHOOL

All of Sexton's Canned Fruits are equally delicious. All are allowed to completely ripen in the sun before being picked. Each fruit is obtained from the locality where it grows best—and then only the choice of the crop is taken. Packed in No. 10 tins, the container most economical for school cafeteria use.

If you went into the finest garden and selected the vegetables to serve your pupils you could find no better than those which come to you packed under the Edelweiss label. Each vegetable distributed by Sexton is selected where soil and climate are best suited to its perfect production. Picked at just the right time, and packed on the spot, they reach you retaining all the vitamin value, full flavor and succulence of the fresh vegetable.

Delicious preserves, jellies, marmalades and fruit butters, made in Sexton's Sunshine Kitchens, are of excellent quality because the materials from which they are made — selected fruits and cane sugar — are the finest obtainable. They are made with great care, in small quantities, giving them the beautiful color and the delicious appeal of home made preserves. In our Sunshine Kitchens we also prepare a complete assortment of pickles, relishes and condiments of quality. Edelweiss mayonnaise dressing, catsup, mustard and chilli sauce are packed in handy gallon glass bottles.

Among other Edelweiss Foods particularly popular with school cafeterias are: Coffee, individual tea, cocoa, gelatine dessert, chocolate pudding, peanut butter, macaroni, spaghetti, canned fish, paper napkins and paper specialties, Edelweiss No. 10 can soups, dried fruits and tapioca.

If one of our representatives has not called on you please write us.

COFFEE IMPORTERS — BLENDERS AND ROASTERS

WESTINGHOUSE ELECTRIC AND MFG. CO.

EAST PITTSBURGH, PENNA.

Sales Offices and locations in more than 110 cities throughout the United States

COMMERCIAL COOKING EQUIPMENT

BAKING AND MEAT ROASTING OVENS

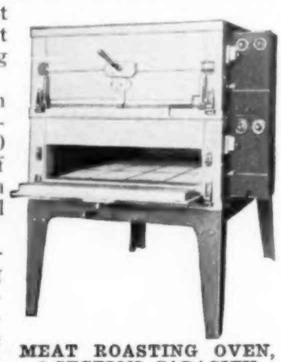
Westinghouse sectional bake ovens have many features, the value of which can be readily recognized. The ovens are of the hearth type and are built in sections.

BAKE OVEN, 2-SECTION CAPACITY

In operation, each deck is independent of the other decks and has separate, automatic heat control. Thus, products requiring different baking temperatures may be baked in adjacent ovens at the same time.

Each section has separate top and bottom heaters, control switches and tile hearth. A complete oven has either one, two or three sections, a bottom panel and a stand of suitable height.

The unique construction accounts for the high efficiency and long life of the Westinghouse Bake Oven. The outer walls are made of heavy lead-coated sheet steel; the inner lining of rust-resistant sheet steel supported by a welded bridgework of angle-iron; the space between the walls is packed with mineral-wool heat insulation. Practically all of the heat generated is kept within the baking chamber.



MEAT ROASTING OVEN, 2-SECTION CAPACITY

Sections are made in four sizes, with capacities 10, 20, 40 and 60 one-pound loaves of bread. Large sizes can be furnished on special order.

Westinghouse sectional meat roasting ovens are made in capacities to meet all requirements from the small restaurant or tea room to the largest hotels or cafeterias. Construction identical with the bake ovens makes possible a combination of baking and roasting ovens serving a very definite need.

These roasting ovens will pay for themselves in a comparatively short length of time, due to the reduced shrinkage of meats in this type as against the fuel types. Three sizes of ovens are available, each of one- or two-section capacity, sections being furnished in 60, 125 and 250-pound sizes.

COMBINATION OVENS

Meat roasting and baking sections are interchangeable. Thus any oven can be made into a combination with one or more meat roasting sections as desired.

HOTEL TYPE RANGES

The Westinghouse three-foot and four-foot section Hotel Type Ranges are built to meet economically all demands for heavy service operation in cafeterias and institution kitchens. The ranges are made entirely of heavy steel with all joints welded, and are built to give lasting service over an indefinite period.

HOTEL TYPE RANGE 3-FOOT SECTION

The three-foot section range is suitable for duty in small kitchens where the four-foot section is not required. Small institutions find this range very adaptable where compact design and durable construction are desired.

The roasting oven in both ranges is equipped with top and bottom heaters adaptable for either roasting or broiling. Ovens can be supplied with either automatic or non-automatic control.

The cooking surface of the four-foot section consists of four cooking plates; the three-foot section two cooking plates, surrounded in each case by a belt of brushed steel trim. These plates are supported by angles and are recessed so that the top is a smooth surface.

All heating units are controlled by three-heat reciprocating snap switches separately fused, giving maximum flexibility of heat control and permitting different operations at one time.

In order to do direct surface cooking alone, a Westinghouse four-foot section cooking top is provided. The top is identical to that of the range with the exception that instead of the oven, a space, divided into two equal sections with a shelf, is provided below the cooking surface for storing pans, etc. A standard black-japanned sheet steel plate shelf can be furnished with all ranges and cooking tops.

HOTEL TYPE RANGE 4-FOOT SECTION

Listed in the Westinghouse Commercial Cooking Catalog 280.

HOTEL TYPE BROILER

HOTEL TYPE BROILER

This Electric Broiler is designed to insure convenience of operation, low operating costs and long life. The frame work of the broiler is of structural steel, well braced with welded joints, making a very rigid construction. Body is heavy grade sheet steel black-japanned with polished steel trim.

Broiler is made in two sizes: capacity of small, 8 kilowatts; capacity of large, which is supplied with a roasting oven, is 18 kilowatts.

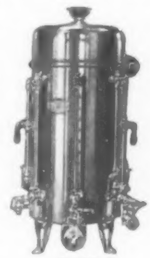
NEW ELECTRIC FRY KETTLE

The new Westinghouse electrically-operated fry kettle is so efficient that it will actually pay for itself in a short time through savings in fat consumption! This kettle maintains such accurate temperature control (only possible with electricity) that the fat does not break down and absorb food particles. Consequently there can be no transfer of taste or odor, and the same fat can be used over and over again to fry doughnuts . . . onions . . . potatoes . . . or whatever the order calls for!

This Electric Fry Kettle is so compact that it requires less than five square feet of floor space even for the largest size . . . can be tucked into any convenient corner. Three models, 60 to 90-pound fat capacity, 4.5 to 11.25 kw. electrical capacity. Furnished complete and ready for action, with wire mesh baskets, supporting screen, and kettle cover. Special screen for doughnut frying optional. Made of heavy cold rolled steel, thick insulation of mineral wool, handsomely finished in battleship gray with black-japanned legs

COFFEE URNS AND STANDS

The Westinghouse electric urn is a combination coffee and hot water urn consisting of two compartments, one for hot water and one for coffee. Coffee cannot be made until the water boils and this boiling water is then sprayed over the ground coffee. The automatic re-pouring feature of this urn then permits the coffee to be re-poured over the grounds to extract the full flavor and strength from them.



SAN FRANCISCO COFFEE URN

The urn body is made of very heavy copper, nickel-plated and polished. The coffee container is made of heat-resisting glass in the smaller sizes and rust-proof metal in the eight and ten-gallon sizes.

The stands combine on electrically heated cup warming space with a solid base for the urn itself. The frame is constructed of angle iron, rigidly braced, while the body is of aluminum-coated steel and all trim of Monel metal.

ELECTRIC GRIDDLES

ELECTRIC GRIDDLE

Westinghouse electric griddles are suitable for both continuous and intermittent operation in cafeterias and institution kitchens. The griddles are made in two sizes with bodies of heavy sheet steel. The feet are cast iron; the legs and switch box are black-japanned and the body is polished nickel plate. Griddles have cast iron tops with heavy grease grooves around the outside edges.

The 20″ griddle has one heater, while the 38″ has two, each covering one-half of the top area. Each heater is controlled by a three-heat reciprocating snap switch.

ELECTRIC HOT PLATES

ELECTRIC HOT PLATE

The Westinghouse hot-plate is in reality a small electric stove suitable wherever high temperature cooking units are needed. The two 1800-watt heating units are of the enclosed type, 8″ in diameter, each controlled by a three-heat snap switch.

The body is of black japan including switch box, top and legs of chromium-plated steel. Rugged construction and attractive appearance are features of this device.

Listed in Commercial Cooking Catalog 280.

MICARTA TRAYS

For Cafeterias and Laboratories

These trays, unlike metal trays, are light in weight, easily kept hygienically clean and therefore are exceptionally well suited for use in school and college cafeterias and restaurants.

MICARTA TRAY

Also because alcohol, moisture, most acids and alkalis have no effect on Micarta trays, they are used in laboratory work where ordinary trays prove unsatisfactory.

Micarta trays have a smooth satin finish that time and use will not mar. Made in walnut burl, black and in fancy decorative designs: 9½ x 12½ in., 10¾ x 13⅞ in., 13⅝ x 17⅝ in., 15⅜ x 20¾ in., 16½ x 22½ in.

DOMESTIC RANGES

Westinghouse makes a complete line of domestic electric ranges which, because they represent the latest advance in modern automatic electric cookery, are ideal for diet kitchens, home economics, laboratories, and the like.

DOMESTIC RANGE TYPE C-83

Listed in Electric Range Catalog 281.

For Interior Lighting Pages, see 130, 131.

ERIE RESTAURANT EQUIPMENT CO.

Erie, Pennsylvania

THE SAV-MOR—A Two - Compartment Unit with a Double-Duty Service for Your School Cafeteria

SAV-MOR
Saves The Flavor

Many years of contact with the restaurant industry brought about this new unit. In it are incorporated new features and advantages for which there has been much demand.

This development is, in principle, a steamer but with mechanical innovations which make it of an entirely new type. Its greatest feature is that of combining the roasting facility with steaming in the top compartment.

Other features give the user all that can be desired in operation and more than expected in food quality.

Multiple Uses

This apparatus is a multiple utility piece of equipment. It is designed for use in large or small kitchens, hospitals, schools—in fact, any place where any quantity cooking is done. It may be used for steaming and roasting separately, alternately, or at the same time; as a proofing oven, dish and utensil sterilizer, warming and drying oven; also for canning.

Double-duty service makes this steamer particularly valuable to the small kitchen and at a reasonable cost where before the expense was prohibitive. Its capacity steaming space makes it just as valuable to the large kitchen and its added features are useful as well.

Food Conservation

The unit eliminates waste in food—food which otherwise finds the garbage can and the rich juices poured into the drain. The original flavor and color are kept and the juices preserved. Shrinkage is reduced; especially in meats where the usual shrinkage has been practically cut in half.

Time-Saving

Automatic control of water supply eliminates constant attention and the steam method does away with burning or scorching even when neglected. The rapidity with which it reaches cooking temperature—and maintains it even with frequent opening of doors—is important to the busy kitchen.

Greater Utility of Space

Both floor space and cooking space are utilized to their maximum. Cooking capacity is 4½ bushels. The required floor space necessary is approximately 9 square feet (3′ x 3′)—an item in the non-too-roomy kitchen.

Easily Cleaned

Its sanitary feature speaks for itself as the cooking compartments and utensils are constructed of Allegheny metal, an alloy which is not attacked by any acids found in cooking, making it easy to keep bright and clean.

Fuel Efficiency

Physical arrangement and design of heating elements conserve fuel to the utmost. Tests show about 90 cubic feet of gas consumption per hour.

The SAV-MOR unit is arranged for steam, gas or electricity.

SAV-MOR makes it possible for the people in charge of your eating departments to serve more attractive, better tasting, and more wholesome food. By eliminating the water in the process of cooking all vegetables, the important body-building elements are retained; this is very important for the development of the student. Cooking vegetables that are attractive and appeal to the eye, is another very important feature.

Low operating costs oftentimes make it possible to serve certain items for less money, which is a very attractive appeal to the students. SAV-MOR System of cooking will, without a doubt, give more service from a single unit than any other single item in the kitchen.

It will serve better food, requiring less floor space, less labor, and less fuel. It is designed for easy operation, which makes it possible for the most inexperienced help to operate.

Don't overlook the fact that SAV-MOR roasting feature is found only in this unit. These exclusive features make this unit most satisfactory for every type and size of school requirements.

Have your preferred jobber tell you more about the SAV-MOR. If he is unable to do so, write us direct and we will be glad to give you a list of many users of this unit.

THE ALUMINUM COOKING UTENSIL CO.

WEAR-EVER ALUMINUM TRADE MARK Reg U S Pat Off

New Kensington, Pa.

WEAR-EVER ALUMINUM TRADE MARK Reg U S Pat Off

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Minneapolis, Minn.
New York, N. Y.
Philadelphia, Pa.
Portland, Ore.

"WEAR-EVER" GAS HEATED STEAM-JACKETED KETTLE

This kettle is ideal for use where cooking must be done for a large number of persons, but where steam is not available the year 'round. It will do everything expected of a regular Steam-jacketed Kettle operated on a steam line.

About 60 minutes are required to bring water to boiling point and create steam in the 60-gallon size of this type kettle. Made in ten sizes from 10 to 100 gallons capacity.

"WEAR-EVER" ELECTRIC PERCOLATING COFFEE URN

This "Wear-Ever" Urn is made entirely of hard, thick, sheet aluminum. Fittings are of nickeled brass; handles of Bakelite. Urn operates on percolator principle and is equipped with electric unit for operation on regulation lighting current. Equipped with switch for "high," "low" and "medium" heat. Made in one size —9 quarts capacity.

"WEAR-EVER" ALUMINUM TRAY

This is the tray that is used so extensively for cafeteria service. Hard, thick sheet aluminum it withstands knocks and bangs of hard service. Size top outside 18¾" x 12⅞"; depth ½".

"WEAR-EVER" RANGE UTENSILS

The "Wear-Ever" line of heavy-duty aluminum ware includes everything needed in the form of range utensils—sauce pans, sauté pans, stock pots, etc.—all made of thick, sheet aluminum, every utensil stamped from single piece of metal without joints or seams and with extra thickness of metal where needed to resist wear.

For full information regarding these "Wear-Ever" utensils, see your regular supply house, or write for catalog.

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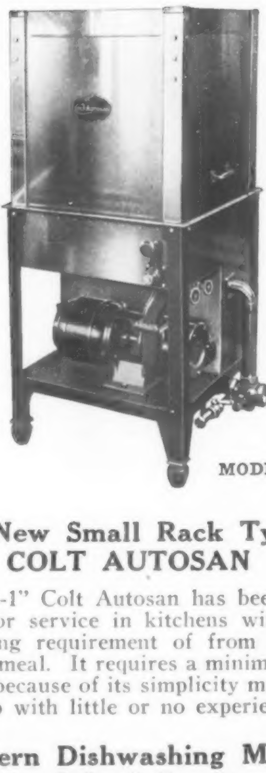
COLT AUTOSAN

DISHWASHING MACHINES



MODEL "R-1"

A New Small Rack Type COLT AUTOSAN

Model "R-1" Colt Autosan has been designed especially for service in kitchens with a tableware cleaning requirement of from 100 to 500 persons per meal. It requires a minimum of floor space—and because of its simplicity may be operated by help with little or no experience.

A Modern Dishwashing Machine for School Service

Quality, ruggedness and simplicity are outstanding characteristics of the new "R-1" Colt Autosan—and its modern mechanical features insure efficient dishwashing service—with extremely low operating costs. It is Colt built—your guarantee of quality and dependability.

Ten Model "R-1" Efficiency Features . . .

1. Rugged construction—quality fittings
2. Constructed of galvanized iron, copper or monel
3. Top is free from mechanism
4. All spray tubes easily removed
5. Spray tubes hinged to facilitate removal of scrap trays
6. Single wash and rinse operating valve
7. Adjustable feet
8. Easy-action doors—corner or straightaway installation
9. Improved, easily cleaned pump
10. Floor dimensions: 27" x 27"; Racks: 20" x 20"

A Complete Line of Nine Models to Choose from

Model "R-1" is the smallest Colt Autosan built. Eight additional models in rack, rotary and conveyor type machines have capacities of 100 to 2,000 persons and up per meal. All have exclusive Colt Autosan efficiency features.

R-1	Rack	100- 500
S-1	Rack	100- 500
RM-1	Rack	700-1100
RA-1	Rack-Conveyor	700-1100
A-2	Rotary	100- 600
B	Rotary	500-1000
C-2	Conveyor	1000-1500
C-22	Conveyor	1200-2000
C-3	Conveyor	2000 and up

Write for complete information describing any of the models listed above. Ask for Packet N and state capacity required.

Architects

Send for your copy of the complete Colt Autosan Architect's Portfolio which contains full information.

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MAIN OFFICE AND SHOWROOMS: 386 4th Ave., New York, N. Y.

Division of Doehler Die Casting Co.,
The Largest Die Casting Organization in the World

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4. Practically no upkeep—retains its lustrous finish for years.
5. Sanitary, because it can be easily disinfected or scrubbed with soap and water without damage.
6. Popularly priced to meet institution budgets.

Get the Facts About DOEHLER Metal Furniture

Six years intensive work in our laboratories indicated to us that we had a line of furniture that would answer the needs of the institutions where metal furniture was the logical material to supplant wood.

Four years of use, under severe, every day conditions, has demonstrated that DOEHLER Metal Furniture satisfies every requirement—appearance, sanitation, economy and durability.

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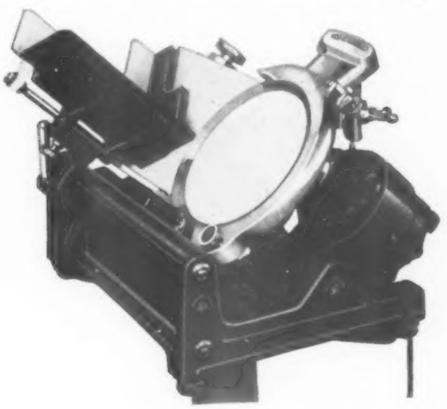
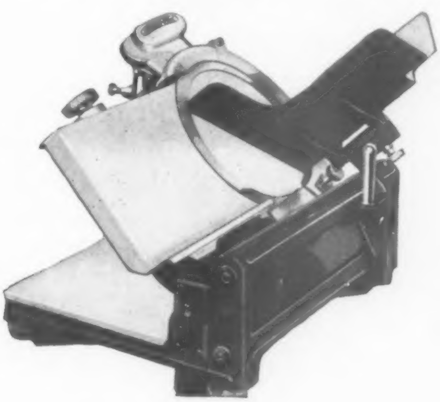
OFFICES IN ALL PRINCIPAL CITIES

This Company, one of the leaders in its field, enjoys an enviable reputation due to the superior advantages of its product, the GLOBE SLICER. The Globe is different from other slicers, as it is the ONLY machine that operates on the GRAVITY FEED principle. The food to be sliced is placed on the inclined feedway (see illustrations), and the FORCE OF GRAVITY automatically feeds it to the blade, requiring no holding, clamping or guiding. This principle also makes it easy to change from one food to the other. Simply lift one off and put on another.

The New Model 40 Globe Slicer Is Ideal for School Cafeterias, Lunchrooms and Kitchens

By reason of its sturdiness, compactness and economy of operation, the new Model 40 Globe Slicer is particularly suitable to the needs of schools and institutions. The Globe slices ANYTHING that can be sliced, to ANY desired thickness (up to three-quarters of an inch). It delivers smooth, even slices, with no left overs, as the Globe slices up to the very last fraction of an inch. It is easy to clean and to keep clean, and even an unskilled worker can run it with complete safety.





Some Additional Globe Features

Large Cutting Surface—permits the slicing of large, bulky foods, as well as derinding of bacon.

Large Receiving Tray—with room for huge quantities of food, as well as wrapping paper or plates.

All Moving Parts Enclosed—no parts of the mechanism can come in contact with the food. Cannot get out of order.

Sanitary—all parts of the machine that touch the food are of porcelain, without screws or metal. Extremely easy to clean.

Absolutely Safe—a special knife-guard eliminates any possibility of danger to the operator.

Equipment—The Globe is equipped with the famous Westinghouse Motor for either A. C. or D. C. current. It has an automatic double sharpener, and a blade of the very highest grade steel obtainable. It occupies little room (size: 17″ high, 16″ wide, 20″ deep). In red or green, with or without pedestal.

Write for further particulars and demonstration without obligation.

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Manufacturers of Complete Laundry Equipment for Schools, Universities and Other Educational Buildings

Factory: East Moline, Ill.

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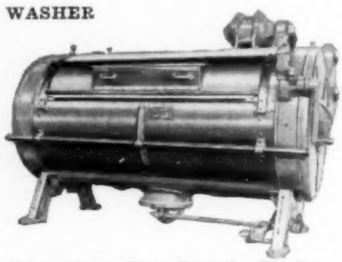
Washers, extractors, drying tumblers, flatwork ironers, and a complete line of other laundry machinery and accessories. A machine for every laundry need, in sizes and types for every installation.

TROY PREMIER WASHER

Troy Premier Washers are built in three cylinder diameter sizes, 36, 42 and 54 in. The two smaller sizes are available with horizontally or vertically partitioned monel cylinders and either wood or monel shells. The 54 in. Premier has the "Y pocket" Type of horizontal partition and is monel throughout.



30 x 36 in. Troy Premier Washer. Monel Metal Shell and Cylinder. Type A Motor Drive

Premier Washers are made in either motor or belt-driven models.

Type A motor drive consists of (a) direct geared reversing motor, mounted on channel supports; (b) a combined inching switch and mechanical brake in conjunction with gear lock; (c) a timer station and reversing control, arranged for wall or panel mounting; and (d) a safety switch on shell doors.

Type B motor drive consists of a one-way motor belted to countershaft by chain belt, with starting switch or rheostat in steel cabinet.

Belt drive with elevated header consists of a positive reversing mechanism, arranged for wide belts and furnished with handle for starting and stopping machine.

TROY MARATHON EXTRACTOR

The Marathon Extractor is designed to handle large-size loads with an economy of space and power consumption. Its speed, smooth running, easy starting and stopping assure savings in operation. Its rigid construction—shell and curb of heavy cast iron; basket of hand-hammered, corrosion-defying copper, reinforced by steel bands—guarantees long service under stress and strain. Perfect balance, improved lubrication make operation and maintenance simple.

Horizontal motor, mounted on cast iron base with adjustable platform for tightening belt and equipped with push button starter and control for wall mounting, is standard motor drive for Marathons. Vertical motor if desired.

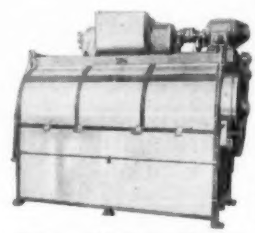
Marathon Extractor, Belt Driven, 26 in. Size with Angle Countershaft Attached

When belt driven, the Marathon Extractor is equipped with angle or straight type countershaft attached, consisting of tight and loose pulleys with friction pulley, mounted in a cast iron frame bolted to the curb. The countershaft is so arranged that the extractor can be set either facing the same direction as the washers when driven off the same lineshaft, or at end of a row of washers, or between a row of washers. The Marathon is also available with a detached countershaft.

TROY PREMIER DRYING TUMBLER

The Premier Drying Tumbler, utilizing the most modern, nature-like drying principle, constant up-draft suction of great volumes of fresh air at low temperature, leads in drying capacity and cleanliness of operation.

High-speed, high-volume fans, with fan inlet ducts at the top of the tumbler, assure perfect circulation of air through wide-mesh wire cylinder. Steam coil is at bottom of machine, correctly placed. Steady up-draft suction and absence of blast-drying eliminate lint trouble, as all lint is blown away from machine through outlet piped to outside of building.



Troy Premier Drying Tumbler, 42 x 90 in. Size, Type A Motor Drive

Premier Tumblers are motor or belt driven. 120 in. models are available in Type A motor drive or belt drive with elevated header only.

All other models may be had in Type A, Type B motor drives, and belt drive.

For special installations all models other than 120 in. size can be had with belt-driven cylinder—motor-driven fan or with countershaft drive.

TROY CONCAVE-CONVEX IRONER

This ironer is entirely different in construction from any other flatwork ironer. **It is made primarily to meet the needs of the school laundry.**

The design is such that, while there is only one chest and one padded roll, the machine has a capacity almost equal to the ordinary five-roll ironer. The chest is made in the standard form, except that it has a large convex lip, and as soon as the goods have passed under the padded roll, they are carried by an apron around this convex lip and the entire lower surface of the chest, thereby obtaining a contact with the heated chest of more than 60 in. The chest has an ironing surface 100 in. wide.

The ribbon feeding device automatically carries the goods to be ironed on to the padded roll, at the point where this roll meets the chest. Just above the ribbon feed is hung the safety stop plate, which prevents the operator from being caught in the machine. A very slight touch on this safety stop plate will disengage the power mechanism, and bring the machine to a full stop.

The driving mechanism consists of a tight and loose pulley, with suitable belt shifting lever. With each machine is furnished a variable speed countershaft for changing the speed of the ironer, according to the thickness of the goods being ironed.

The motor drive consists of a motor directly geared to the machine. With this motor drive is furnished the necessary starter and control.

Troy Concave-Convex Ironer, Feed Side, Showing Motor Belt Drive

FOR DESCRIPTION OF TROY SCHOOL ADVISORY SERVICE, SEE PAGE 283

Section IX

INDUSTRIAL EDUCATION

Factors Which Have Influenced the Design of the Holyoke Vocational School

BY LLOYD P. YOUNG

DIRECTOR OF RESEARCH AND GUIDANCE, SCHOOL DEPARTMENT, HOLYOKE, MASS.

THE new Holyoke Vocational and Continuation School, now in process of construction, is the city's answer to the ever increasing demand for vocational training. The first vocational school in Holyoke was organized in 1913, with two departments and an enrolment of 45 pupils. It was located in the basement of the high school building. The following year a new building was constructed which has housed the vocational school since that time. At present there are 180 pupils enrolled in six departments. During the eighteen years of the vocational school's existence in Holyoke the demand for vocational training has constantly increased, until now the shops are filled to capacity and there is a continual waiting list of boys who wish to enroll in the school.

The proposed vocational school will be a 23-room, two-story brick, modified U-type building. The contracts will be let and construction will begin during the summer of 1931. This building will house the vocational and continuation school divisions of the Holyoke public schools.

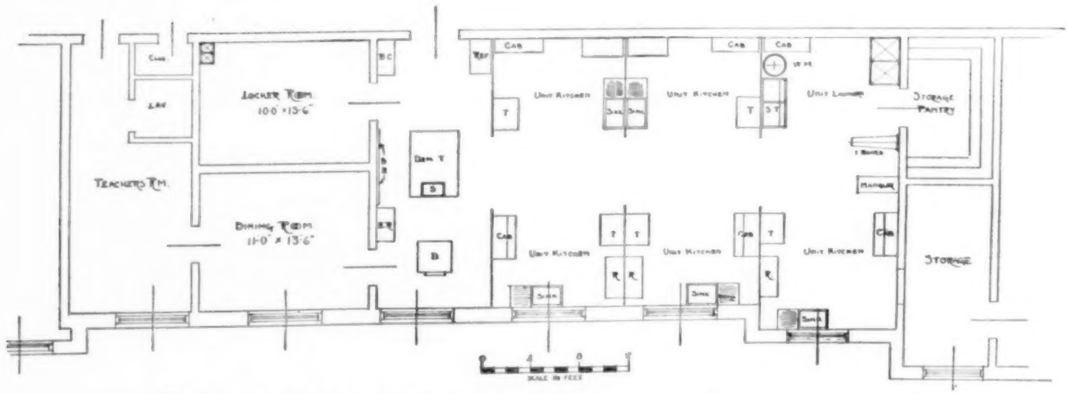
Shop Requirements

A vocational school building housing various kinds of shops demands a different type of planning and construction from that required of the regular academic school building. In an academic school building it may make little difference whether the fourth or fifth grade is placed in Room 4; but in a vocational school the auto-mechanics shop, for example, cannot be shifted so easily from room to room. Such a shop requires a room wide enough to get automobiles in and out, a systematic arrangement in the room of the cars that are being worked on, and working space around each car. The room requires a greater ceiling height to allow the use of cranes and hoists for raising cars or for taking out the engines. The auto shop should be located on the first floor, so that cars can be taken in and out by their own power, eliminating the use of a large, expensive elevator.

The printing shop has its particular requirements of size, shape, and location, so that the equipment may be operated efficiently. In turn, the carpentry shop requirements are different from those of the auto-mechanics or the print shop.

Special Type of Construction

A different type of construction from that used in a regular academic building is required for a



THE LAYOUT OF THE COOKING ROOM IN THE HOLYOKE VOCATIONAL SCHOOL

vocational school: it must be so designed that heavy machinery may be placed and operated safely on the second floor as well as on the ground floor. The shop requires all the light that can be obtained from two or more sides, instead of the unilateral type of lighting used in the academic classroom. As many of the special requirements for each type of shop have been incorporated in the Holyoke Vocational School building as could economically and efficiently be included.

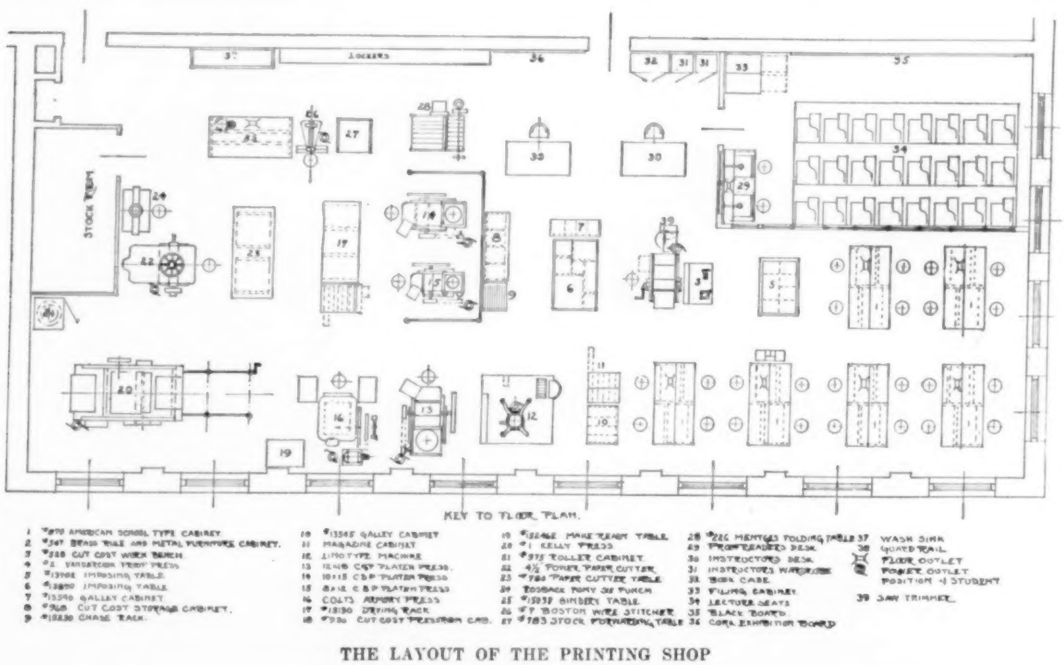
The First Floor Layout

No shops are located below the ground level. On the first floor are the administrative offices, two related-work classrooms, and the auto-mechanics, sheet-metal, printing, carpentry and machine (continuation school) shops. The auto shop is 50 x 74, located in one corner of the building. The drive entrance is in the center of the end of the room. This allows a row of automobiles to be placed on either side, with a center driveway and room for work benches along each side wall. The shop is lighted on two and one-half sides; the tool and battery space is along the dark side. The floor is dropped two feet below the floor level of the other rooms to allow sufficient height to operate cranes and hoists.

The sheet metal shop is 30 x 50 and the printing shop 32 x 72. This shape of printing shop permits a convenient arrangement of presses, type cases and stones, in order to secure maximum natural light and efficient operation and administration.

The Carpentry Shop

The carpentry shop is 30 x 92 with windows on two sides, thus permitting the arrangement of the



THE LAYOUT OF THE PRINTING SHOP

power machines and work benches so as to receive a maximum of natural light. Across the corridor from the carpentry shop is a finishing room. A finishing room from which the dust and dirt of a woodworking shop are shut out is essential if finished work using varnish, lacquer, or paint is expected from a carpentry department. The two classrooms for related work are of average size (23 x 26) and will be equipped with tables and chairs. This allows the class to work out the related work by the laboratory or group method.

The administrative offices consist of a general office, principal's office, medical and emergency room, and men teachers' room. The medical room will be equipped for both physical examinations and first aid treatment. A large amount of machinery operated by two hundred boys offers possibilities of accidents, even though every precaution is taken to prevent them. A well-equipped medical and first aid room is necessary to care for such accidents as may occur.

On the Second Floor

The second floor contains the machine shops for both the vocational and continuation schools, a shower room, a drafting room, an electrical shop, three classrooms, a women teachers' room, and the household arts suite.

The (vocational) machine shop is 50 x 74, with windows on two and one-half sides to permit the arrangement of machinery to secure the maximum utilization of natural light. The more nearly a room approaches the shape of a square the easier it is to supervise. A smaller machine shop, 30 x 50, which will be used principally by the continuation school boys, adjoins the larger machine shop.

A drafting room 42 x 30 is located on this floor. With a skylight and north lighting this room is admirably located for drafting work. The electrical shop, 30 x 50, adjoins the drafting room. These rooms are well suited to upper floors owing to the light-weight equipment used.

The Household Arts Department

The household arts department consists of foods laboratory, dining room, sewing laboratory, and practical arts room. The foods laboratory is 23 x 42 and will be equipped with five unit-type kitchens, an electric stove and oven, electric refrigerator, and electric washing machine and mangle. A small dining room adjoins the foods laboratory, and on the other side of the dining room is the women teachers' room. The door between these two rooms allows the teachers' room to be used as a reception room in connection with the dining room. Adjoining the foods laboratory there is a small locker room which will be equipped with unit or compartment steel lockers to be used by the students. A small pantry and storage room is built in one end of the laboratory.

The sewing laboratory is 32 x 36, and will contain such equipment as sewing tables, cutting tables, sewing machines—electric and foot pedal, —and a fitting booth. Between this and the practical arts room is another locker and storage room, to be equipped with unit or compartment lockers. Sufficient space must be allowed for each girl to keep her sewing materials safe. The practical arts room will care for the household management and home nursing work. There are three regular classrooms on this floor.

Expansion Provided For

This building will be filled to capacity in a few years if the demand for vocational education continues at the present rate. However, provisions have been made so that the building can be added to in two places. The present wing may be extended. Another wing can be constructed from the other end of the building parallel to the present wing. The space for the secondary corridor for this wing has been made into a temporary storeroom for use until any addition to the building requires that space.

The G. P. B. Alderman Company, of Holyoke, are the architects for the building. Drs. N. L. Engelhardt and G. D. Strayer, of New York City, are the educational consultants.

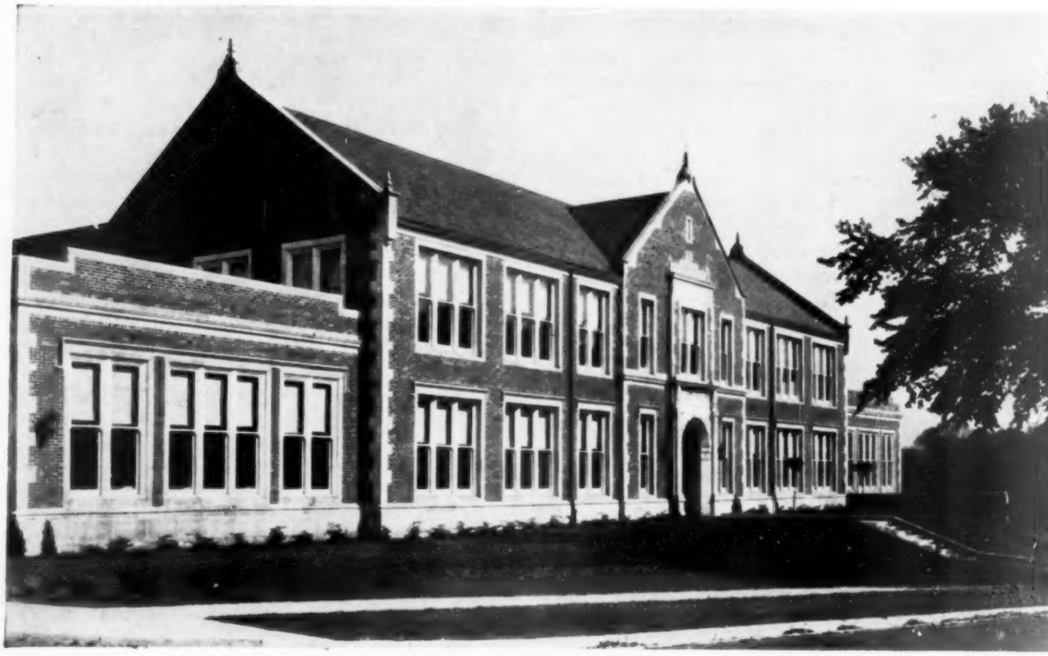


FIG. 1. THE INDUSTRIAL ARTS BUILDING AT NORTHERN ILLINOIS STATE TEACHERS COLLEGE

An Industrial Arts Building for Teacher Training

BY MILO T. OAKLAND

HEAD OF INDUSTRIAL ARTS DEPARTMENT,

NORTHERN ILLINOIS STATE TEACHERS COLLEGE, DEKALB

THE Edgar B. Still Building, recently erected at Northern Illinois State Teachers College, for the housing of the Industrial Arts Teacher-Training department, contains an exceptionally complete layout of shops and equipment, which has proved very satisfactory.

In planning this building, the architect was faced with an unusual problem in regard to location. Because of the nature of the appropriation, it was necessary to place the new building near the Men's Gymnasium, which was being built at the same time. The Gymnasium having been logically located near the athletic field, the arrangement of the college campus made practically only one location possible for the Arts Building. This necessitated placing the new structure on ground of different levels. As a result, as the photograph in Figure 1 shows, one part appears as a one-story, another as a two-story, and still another part as a three-story structure. However, this seeming inconvenience in location has resulted in a rather unique arrangement of shops and classrooms which has proved extremely convenient.

The Arts Building, built of red brick and steel with limestone facings, is of the Collegiate Gothic type, to harmonize with the other buildings of the campus grouping. Its dimensions are 80 feet by 190 feet, a rather imposing building for a college with an enrolment of 750 students, two-thirds of whom are women. The main part of the building is 64 feet by 120 feet in ground area, 42 feet in height at the front and 52 feet at the rear. At the ends are wings, 35 feet by 80 feet, the east wing being 30 feet in height and the west wing 19 feet high.

Woodworking Shop and Glue Room

As the floor plan shows (Figure 2), the main floor of the east wing is taken up by the woodworking shop. This shop is designed to accommodate both elementary and advanced classes in woodworking and related courses, such as upholstery, wood-turning, and carpentry. The benches, where the hand work is done, are grouped in the northern part of the shop, leaving the south portion, where a more direct light is obtained, clear for the machines with which an industrial arts teacher must be very familiar. All the machines are connected with the blower exhaust system, which carries away the dust and shavings to a special room on the grade floor. A

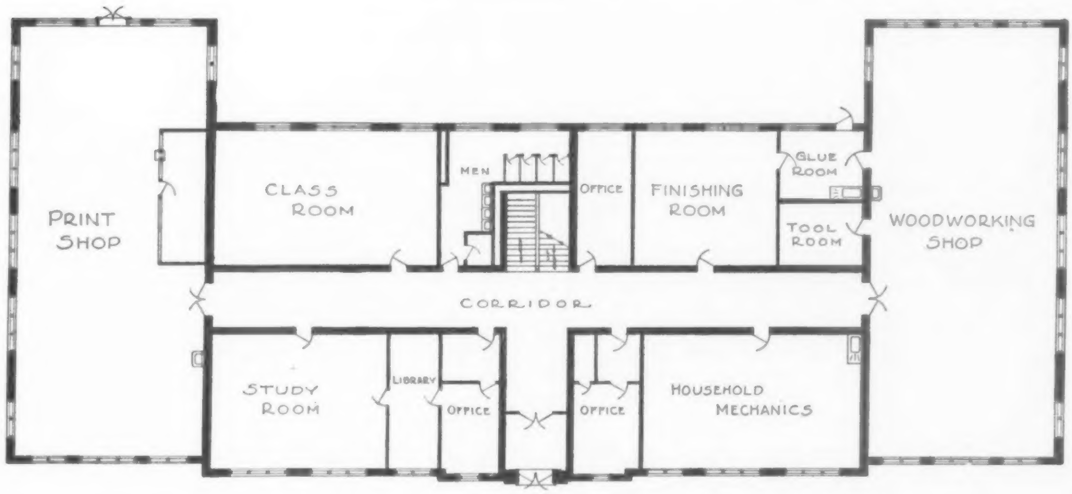


FIG. 2. THE FIRST-FLOOR PLAN OF THE INDUSTRIAL ARTS BUILDING

tool room, where all the hand tools are kept and checked out to individual students, is located at the west of the shop proper. Here, rather elaborate toolracks and cabinets for storage of supplies such as nails, screws, sandpaper, etc., make for an orderly and systematic solution of an otherwise difficult problem in a school woodworking shop.

The glue room is located directly between the woodworking shop and the finishing room. Here, steam tables, clamps, and glue pots are placed, providing a definite place for everything needed in the glueing-up process. The finishing room provides ample space for the applying of various kinds of finishes, and is equipped with devices for giving instruction in modern methods of finishing wood. A booth, provided with an adequate exhaust system, carries away the fumes and mist accompanying spray finishing. Rubbing tables are also a part of the finishing room.

Across the corridor, on the south side of the main building, is the household mechanics shop, equipped for instruction in plumbing, electricity, cement, and sheet-metal work. This room is also adapted for classes in Art Metal, a course offered during one quarter in each school year.

FIG. 3. THE LOCATION OF EQUIPMENT IN THE PRINT SHOP AND IN THE WOODWORKING SHOP

Near the main entrance on either side of the corridor are the offices of the instructors who have charge of the work in the industrial arts department. Sufficient space and equipment have been provided to enable each instructor to have his own sanctum. In each can be found the records, drawings, magazines, books and other materials relating to the subjects taught by the instructor. These offices offer an excellent opportunity for student consultation, which is very necessary in a teacher-training institution.

Down the west corridor and at the right, within easy reach of the shops, is a large classroom provided with tablet-arm chairs. This room is used regularly by the various classes in industrial arts as a recitation room. It is an excellent place for holding group meetings of the Industrial Arts Club and other organizations, and is often used as a lecture room when slides or moving pictures are exhibited.

Across the corridor from this classroom are the study room and the shop library. These rooms are arranged so as to aid especially the students who are doing student teaching. The library, containing several hundred volumes, gives reference material for practically all the industrial arts subjects. Placing the shop library apart from the general library and giving easy access to it has resulted in a more general use of the industrial arts books. Now books are used almost daily that formerly were seldom called for.

A Well-equipped Printshop

The printshop takes up the entire west wing of the Industrial Arts Building. This school boasts of having had one of the earliest school printshops in America, and each year places many of its graduates as teachers of printing in elementary, junior high, and senior high schools throughout the United States. As practically all the industrial arts subjects emphasize the elementary phases of work, it is the plan of the school printshop to deal especially with elementary printing. In keeping with this idea, the equipment is planned to meet the elementary demands. However, the equipment conforms, as far as possible, to that found in commercial printshops. In a few instances special school equipment has been designed to better meet the conditions of the schools. The individual school racks used in hand composition are grouped so as to get the south light. The equipment for locking-up is found near the center of the shop, so as to be accessible to both compositors and pressmen. In the north portion of the shop are the presses and binding equipment. Instruction in machine composition and cylinder presswork will be given at an early date, and space in the north portion also has been left for this work. As shown by the drawing of the printshop (Figure 3), a separate room gives space for the storage of papers, rollers, ink, etc.

On the second floor are the drafting room, the handwork and bindery room, a classroom, and the editorial office of *The Northern Illinois*, the college paper. The drafting room is arranged so as to provide the best light possible, either natural or artificial. Twenty students can be accommodated at one time at the drawing tables, and five others can work at full-size drawings at large tables. Also in the drafting room are the electric blueprint machine, the washer and dryer for prints, and other items of equipment necessary in the training of industrial arts teachers.

On the grade floor are the auto-mechanics shop, machine shop, and storage space for lumber and other supplies. The auto-mechanics shop is immediately below the woodworking shop and is therefore the same size. It has an outside door that allows for easy entrance for automobiles. The equipment is planned especially for giving instruction in car maintenance and elementary repair. The machine shop occupies a room 24 feet by 52 feet. It is equipped to handle the usual kinds of work done in a school shop. At the present time, only small classes are accommodated in this work, but plans call for a very complete line of equipment to be added at an early date.

Provisions for Expansion

In planning this Arts Building, considerable thought was given to the problem of further expansion. On each floor there is space available for new shops, and other changes could be made quite easily in the present arrangement, if occasion should arise. The classroom on the second floor and the storage space on the grade floor could both be used for other purposes. It is thought that this Arts Building is adequate to meet the changes that new courses will demand to keep it up to date with modern trends.

The building is of fireproof construction and its cost of upkeep and maintenance has been reduced to a minimum. The interior walls of the entire building are buff-colored salt-glazed brick. The floors in the corridors are terrazzo and the floors in all the shops and classrooms, except those on the grade floor, are maple. The total cost of the completed building was approximately $135,000, and the cost of the equipment, including tools and machinery, is estimated at $40,000.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Automotive Supplies—Motor Tool Specialty Co.
Blue Print Equipment and Drafting Room Tables—C. F. Pease Co.
Classroom Furniture and Office Equipment—Tell City Chair Co.
Clocks and Signal Systems—Time Systems Co.
Drinking Fountains, Plumbing Fixtures, Sanitary Equipment—Crane Co.
Lighting Globes and Fixtures—Graybar Electric Co.
Lockers—Lyon Metal Products, Inc.
Machine Lathes—South Bend Lathe Works.
Presses and Cutter—Chandler & Price Co.
Printshop Equipment—American Type Founders Co.
Woodworking Benches—E. H. Sheldon & Co.
Woodworking Machines—Oliver Machine Co.; Yates American Machine Co.; J. D. Wallace & Co.
Woodworking Planes and Tools—Stanley Rule and Level Plant

The Planning of Industrial Arts Units

BY T. A. HIPPAKA

SUPERVISOR OF INDUSTRIAL ARTS, MADISON PUBLIC SCHOOLS, MADISON, WIS.

CERTAIN general considerations must not be overlooked when plans are being made for an industrial arts unit. The needs of the community should be analyzed. Before construction is started, many questions like the following must be raised and answered.

What are the objectives of industrial arts in the school in question? What funds are available for construction purposes? How much is to be expended for equipment? Where is the industrial arts department to be located with reference to the rest of the building? How large should the unit be? What is to be the plan of the unit? How many shops are to constitute the unit? What is to be the arrangement of machinery and equipment in each shop?

Isolation and Future Expansion Should Be Planned For

The industrial arts unit should be somewhat isolated from the classroom section of the building, especially because of the noise so common in shops. This isolation can be obtained in at least two ways: one is to build a separate building; and the other is to build the unit in the rear of the main building, to which it can be joined by a narrow section wide enough for a hall.

It is generally wise to make some provisions for future expansion. If necessary, the first floor of a wing or separate building may be constructed as a beginning. Footings and walls should be made heavy enough, however, so that a second story may be added at a future date. Shops should be so designed as to be easily convertible to meet the needs of a changing world. We are living at a time when there is likely to be a changing emphasis in our schools. Especially is this true in the case of industrial arts.

Structural Requirements

Gas should be provided, as well as 110- and 220-volt outlets in each shop. Every workroom should have a drinking fountain and facilities for the boys to wash their hands, in order to minimize the necessity of leaving the shop during the class period. Convenient lockers and storage space in each shop should be provided for students and teachers. Heat, light, and ventilation should receive careful attention.

Shops should be so arranged that pupils will be constantly under the direct supervision of the teachers. Corridor space should be reduced to the minimum possible without inconvenience to pupils and instructors. Plain, unbroken walls should predominate in the shops. Doors should be large enough to make it easy to install machines and benches in the various shops. Concrete floors should be avoided.

The Supervisor and His Staff Attack the Problem of Planning

During the planning of a new unit the supervisor of industrial arts must keep in constant touch with the superintendent of schools, and, if possible, with the individual who is to be the head of the school. The supervisor must be careful to consider the requests of his teachers, and to call them in when he is planning the unit. No doubt there will always be some requests that cannot be granted. He explains to his staff the inadvisability of pushing such matters. Teachers soon realize that they are an important cog in the planning of the new unit. Instructors appreciate that if the unit is to be properly planned, their cooperation is both vital and necessary.

Formulating a Budget for the Purchase of Equipment

A budget estimate for equipment and machinery is made by the supervisor immediately after all plans have been completed. He should then be in a position to know exactly what equipment and machinery will be required, all of which he has justified or it would not have been permitted to remain on the plans. Budget-making should not smack of guessing. Inaccurate approximations will cause much embarrassment before the shops are ready for occupancy.

When the supervisor is formulating a budget, he should communicate with reliable firms and obtain current prices on the types of machinery and equipment specified on the plans. Then as the machinery and equipment are being purchased, he will find that the appropriations are large enough to meet the requests, and that he is not denied very necessary equipment because of a shortage of funds.

A Typical Plan

The plan of the industrial arts unit presented here resulted from a carefully made survey of the interests and needs of the boys for whom it was intended. The plan was followed in the construction of the West High School in Madison, Wis. Provisions were made for printing, machine shop and sheet metal, woodworking, automotive work and drafting. In order to economize on space and equipment, sheet metal work and machine shop work were assigned to the same room, while automotive repair and electricity constitute another combination.

THE WOOD SHOP OF THE WEST HIGH SCHOOL, MADISON, WIS.

THE PRINT SHOP

Length and width of corridors were cut to a minimum. Waste space was fairly well avoided in each shop by careful planning and placement of equipment while the size of each shop was still under consideration.

Twenty-five Points to Keep in Mind When Planning an Industrial Arts Unit

1. The woodworking machinery, because of its high speed and consequent noise, should be farthest removed from the classroom section of the building.

2. A corridor 8 feet wide and as short as possible is recommended.

3. Doors leading into the various shops from the halls should not be opposite one another. To look across the corridor from one shop into another is not an advantage. An opening 6 feet 4 inches wide with two 3-foot 2-inch x 7-foot doors, constitutes a minimum doorway. Doors must open into the corridor. It is important to place doors in such a manner as to minimize the distance that pupils must travel in order to reach their shops. Where there is a long corridor, doors should be so distributed as not to cause a crowded condition anywhere, particularly during the changing of classes.

Outside doors with concrete driveways leading to them should open into the woodshop, machine shop, and automotive shop. These doors should be of steel with the upper two-fifths glass. Outside doors are essential in these shops so as to facilitate the delivery of heavy supplies and equipment. An automobile may also be driven into the auto shop or the machine shop for repairs. Exterior doorways should be at least 8 feet wide and 8 feet high.

4. The grading as well as the driveways around the unit should be so low that water will not run into the shops underneath the doors.

5. Floors should receive special attention. The floor in the drawing room and the print shop should be 1″ x 2¼″ groove-and-tongue maple. The floors in the remainder of the shops should be of wood block, with the exception of a section in the automotive shop used for holding cars. This piece should be of concrete.

6. Gas and electric outlets for 110- and 220-volt current should be provided in every room regardless of the type of activity. The shop is then readily adaptable to any change of activity which may be contemplated later.

7. The size, type, and location of the motor for each machine must be specified with accuracy. Ordinarily motors come in sizes of ½-, 1½-, 2-, 3,- 5-, 7½- and 10-horsepower.

8. Machinery should be of the individually motor-driven type.

9. Where a two-story unit is contemplated, the shops housing the heavy machinery should be on the first floor.

10. The exact location of every piece of equipment and machinery must be shown.

11. The position of blackboards and bulletin boards should be given.

12. Sufficient cabinets should be provided for teacher's belongings, the work of the pupils, materials of instruction, tools and equipment, books, and reference materials.

13. Exhibit cases centrally located should be provided for the purpose of displaying the work of pupils.

14. Wash-room and drinking facilities should be provided in every shop in order to minimize the necessity of pupils leaving the room.

15. All of the plumbing should be centered in one section of the building for the purpose of economy, and should be placed in an inside wall to guard against freezing.

16. Proper heat should be provided by radiators or steam coils.

17. Windows or skylights should be so placed as to avoid cross light, at the same time allowing ample natural light.

18. Sufficient artificial light should be provided for night work. Drop cords should be installed over every machine.

19. A blower system should be installed in the woodworking shop.

20. A fan should be installed in the auto mechanics shop to take care of gas fumes.

21. A chain hoist running on an overhead I-beam should be provided in the auto mechanics shop.

22. Where funds permit, a lift in the floor, operated by compressed air, should be provided in the auto mechanics shop.

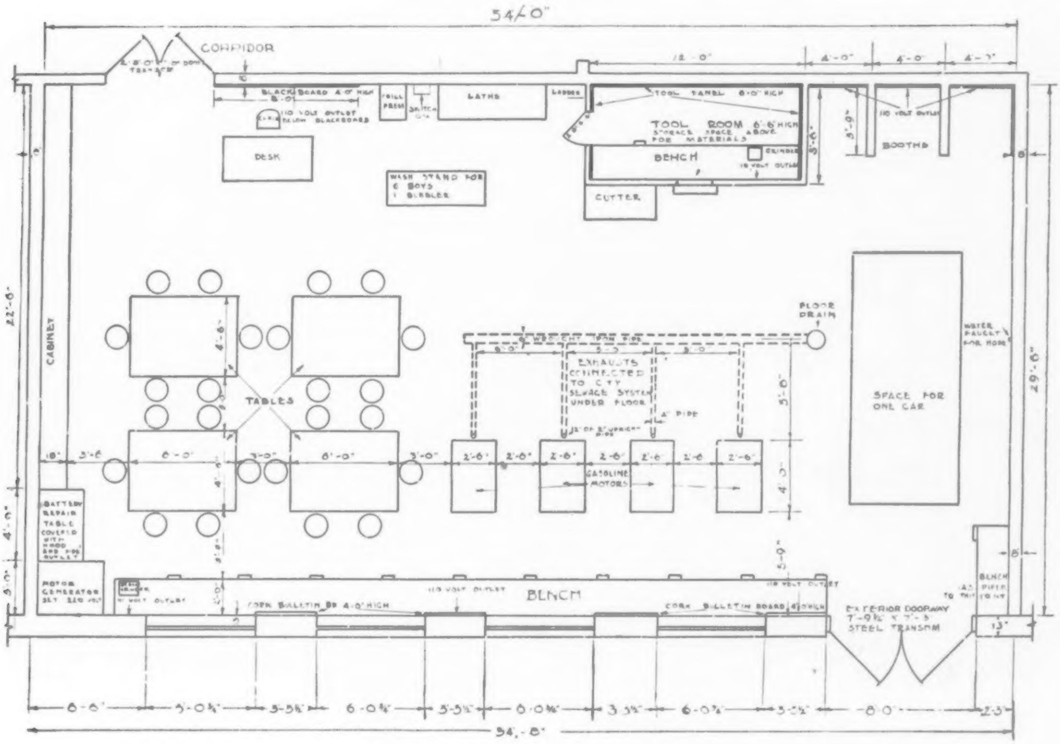
23. An acetylene generator room as well as a sludge pit should be provided where welding is to be taught.

24. It is important for the supervisor to be constantly on the job during the period of construction.

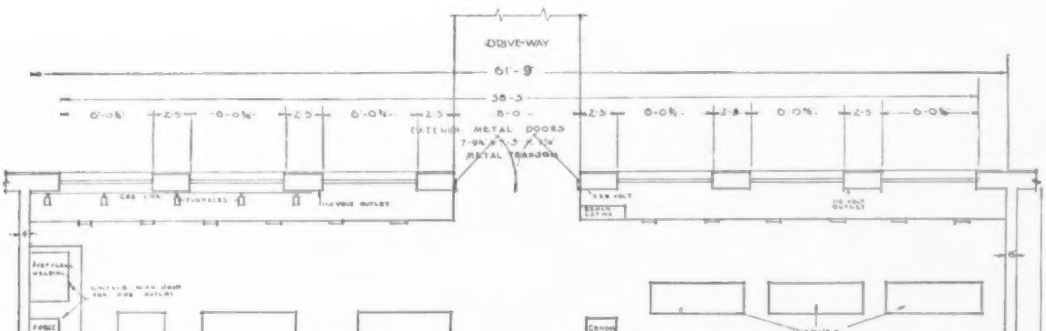
25. The supervisor should make a special attempt to promote and to foster the very best working relationships among all of his associates.

THE AUTO MECHANICS AND ELECTRICITY SHOP OF THE WEST HIGH SCHOOL, MADISON, WIS.

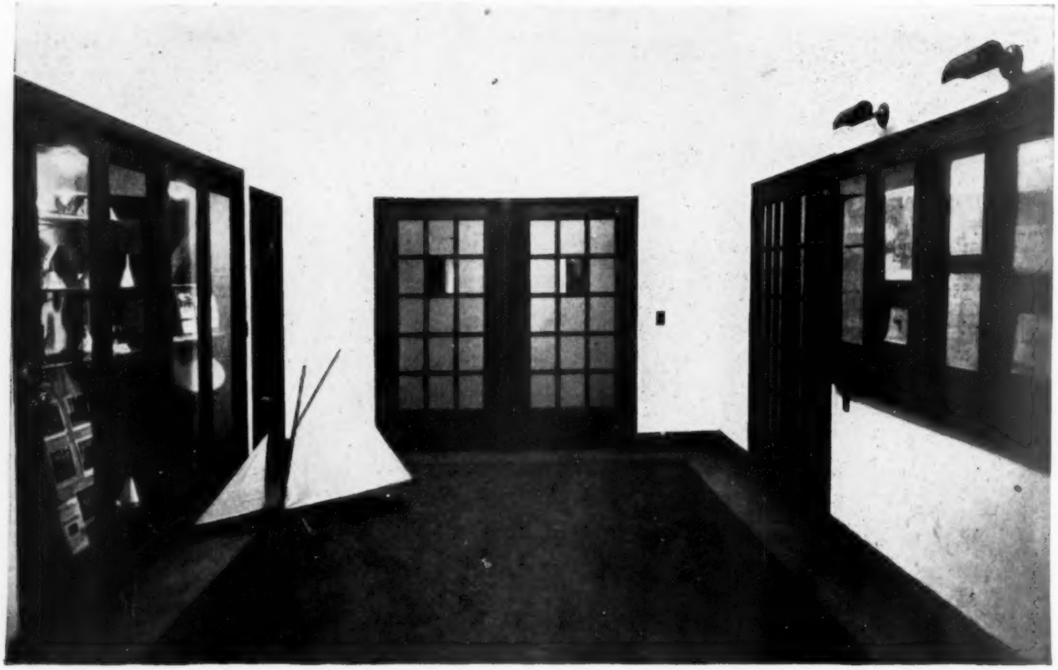
THE MACHINE AND SHEET METAL SHOP



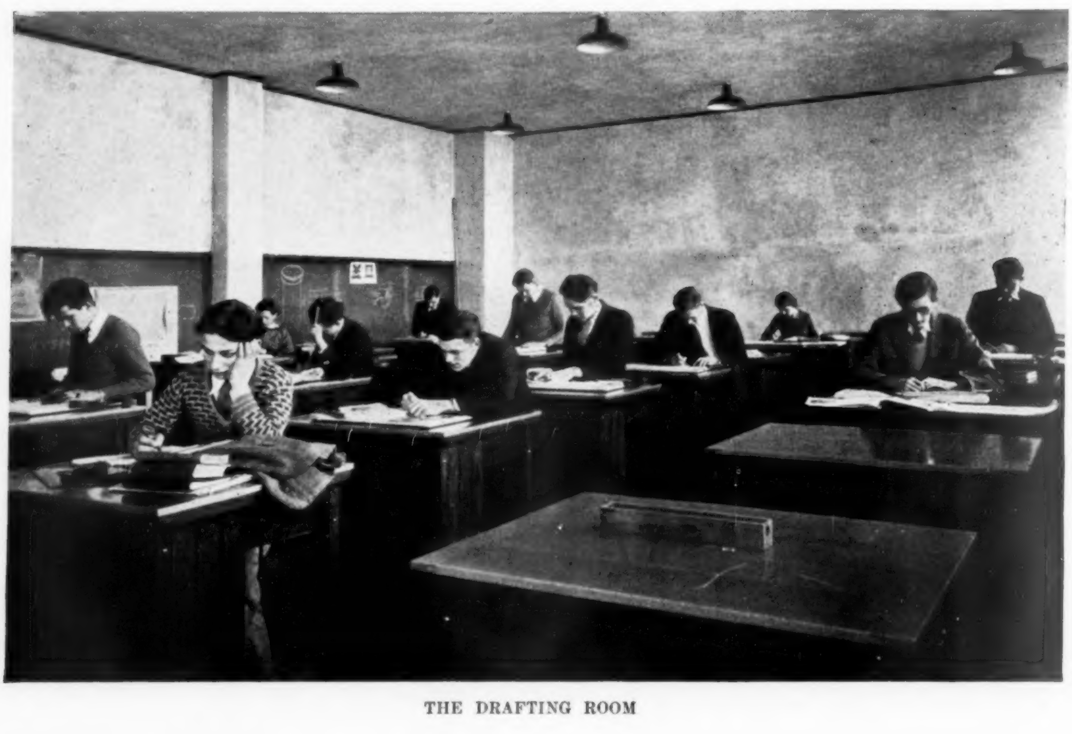
THE FLOOR PLAN OF THE AUTOMOTIVE AND ELECTRICAL SHOP



THE PLAN OF THE MACHINE AND SHEET METAL SHOP



THE SHOP VESTIBULE IN THE WEST HIGH SCHOOL, MADISON, WIS., WHERE WORK IS CONSTANTLY ON DISPLAY



THE DRAFTING ROOM

SIDNEY MACHINE TOOL CO.

Sidney, Ohio

This New Junior "30" Individual Motor Drive Woodworker for Manual Training Departments Consists of

12" Jointer with safety cylinder head, 3-hp. motor mounted direct on arbor, with switch for starting and stopping

27" Band Saw with 1-hp. motor, with individual switch for starting and stopping

Tilting Top Saw Table equipped with 2-hp. motor with individual switch

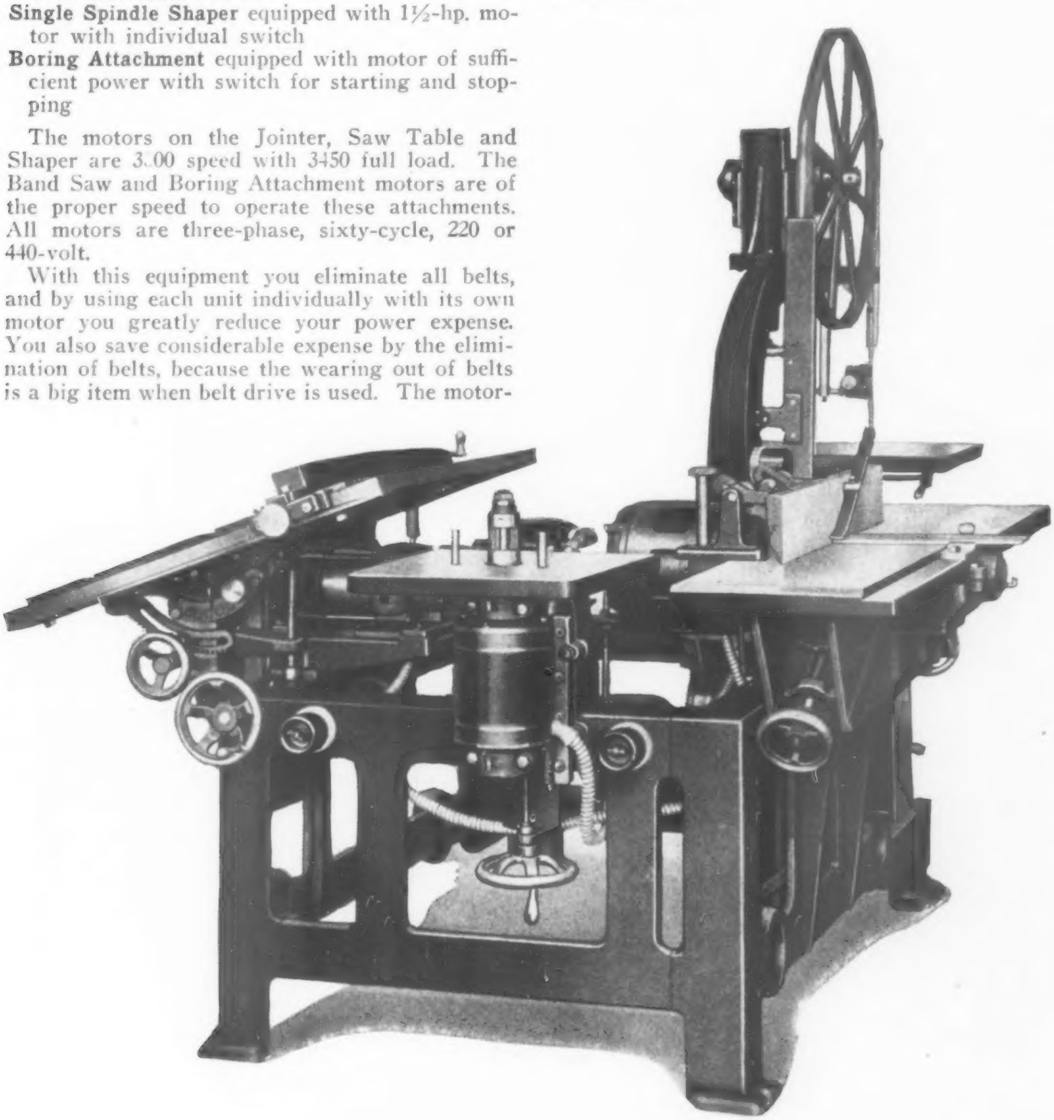
Single Spindle Shaper equipped with 1½-hp. motor with individual switch

Boring Attachment equipped with motor of sufficient power with switch for starting and stopping

The motors on the Jointer, Saw Table and Shaper are 3600 speed with 3450 full load. The Band Saw and Boring Attachment motors are of the proper speed to operate these attachments. All motors are three-phase, sixty-cycle, 220 or 440-volt.

With this equipment you eliminate all belts, and by using each unit individually with its own motor you greatly reduce your power expense. You also save considerable expense by the elimination of belts, because the wearing out of belts is a big item when belt drive is used. The motor-driven woodworker will also give you more power and do much heavier work.

Other products of the Sidney Machine Tool Company for school shops are: **Model 16 Type "A" Variety Saw,** specially designed for manual training schools, cabinet shops, automobile body shops, planing mills and pattern shops; **Inclined Bed Jointers** in four sizes—12", 16", 20" and 24", both belt and motor driven; and **Single Surfacers,** in 18 x 8" and 24 x 8" sizes, motor driven. **Write for circulars.**



WICKES BROTHERS

Established 1856

Manufacturers of

Wickes Complete Blue Printing Equipment

SAGINAW, MICHIGAN

MODERN SCHOOL DRAFTING EQUIPMENT

Hundreds of schools are now using Wickes Brothers equipment in their drafting rooms—Wickes Blue Printing Machines, Washers and Electric Dryers—so low in first cost, so economical in operation, so simple and safe to operate, and so compact, that practically every school can afford to teach its students real industrial practice.

WICKES CONTINUOUS ELECTRIC BLUE PRINTING MACHINE

THE WICKES WASHER

The Wickes Horizontal Blue Print Washer washes prints speedily and without muss and bother, and is extremely durable. The washing tank (36 x 48 inches) is of strong sheet metal on angle iron legs, with sufficient slant so water will run rapidly from the prints that are being washed. A pipe with a gang of holes to give spray effect is mounted on the back.

WICKES BLUE PRINTING MACHINES

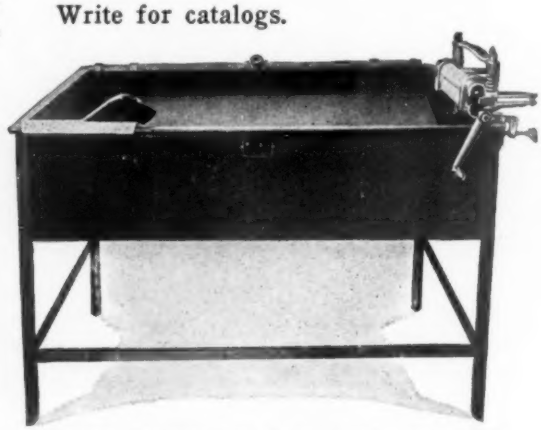
These machines will print separately cut sheets or continuous rolls in any length and in widths from 2 to 48 inches. It is entirely automatic, the only work required of the operator being the placing of the tracing and blue print paper on the traveling belt. The prints are absolutely uniform in tone, the lines sharp and clear. All work is done in broad daylight. There is no glass cylinder to clean, break or replace. Extremely simple in operation, this machine will outprint any other machine per unit of electricity consumed. **Made in two models.**

WICKES ELECTRIC DRYER IN OPERATION

THE WICKES ELECTRIC DRYER

This Dryer will dispense with the old method of hanging prints on racks to dry, thereby doing away with drippings and conserving floor space. A revolving seamless steel cylinder insures a steady, even heat at all times. It will take blue prints up to 46 inches in width, and in unlimited lengths. Operation is continuous, and as nearly automatic as possible.

Write for catalogs.



WICKES HORIZONTAL BLUE PRINT WASHING TANK

Section X

LABORATORY

The Biology Wing of the Biology-Geology Building, University of Rochester

BY WILLIAM DAYTON MERRELL
DEPARTMENT OF BIOLOGY, COLLEGE OF ARTS AND SCIENCE, UNIVERSITY OF ROCHESTER, ROCHESTER, N. Y.

THE Biology and Geology Departments of the College of Arts and Science at the University of Rochester occupy separate wings in a new building. The building faces a little east of north. Geology preferred the more shady east wing and Biology the sunny exposure of the west, so both departments are satisfied. The two wings are connected with a Museum, in which exhibits will be arranged to show the actual continuity of life in the past and the present.

The entrance to the building from the main quadrangle of the campus leads directly to the main floor, marked on the plans as the "first floor." This is really the second floor, for the ground slopes away so that the entire south and west exposures of the lower floor are above ground, doing away with any appearance of a "basement." Each department, including the museum and the greenhouse, has a convenient rear entrance from the parking area. This article is concerned only with the Biology wing.

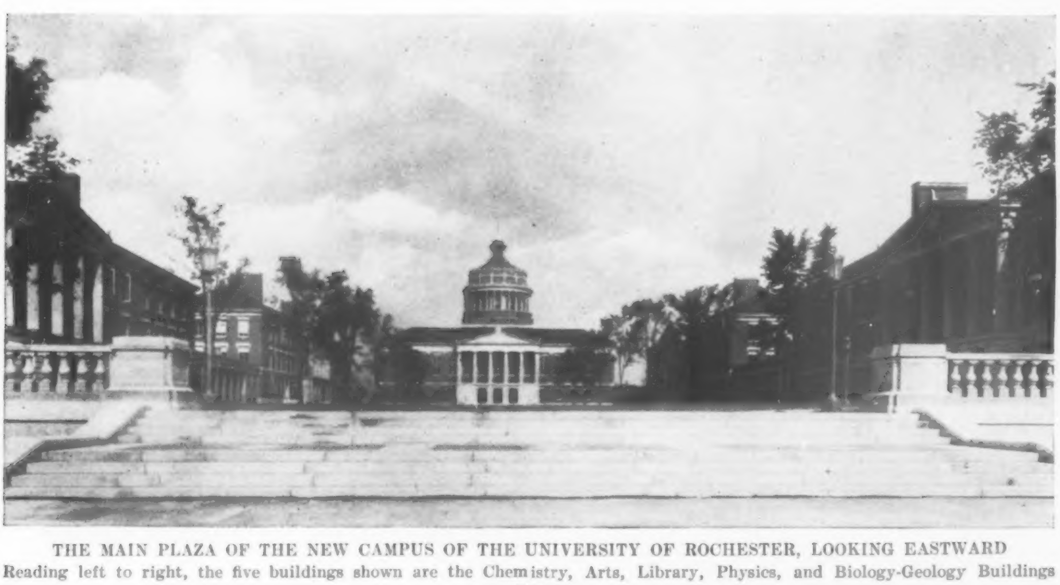
The Ground Floor

On the ground floor of the Biology wing, under the two general laboratories on the first floor, is the lecture room, which seats about 140. Opening off the lecture room is a preparation room for charts, slides, etc. A corridor leads back to the Genetics laboratory, which is behind the lecture room, and then on to the one-story Vivarium, which is thus connected with the main building. Across the corridor from the lecture room, a special Cooking Room, with a ventilating hood and fan to outdoors, serves both Genetics and Botany courses. There are also three offices in the wing on this floor.

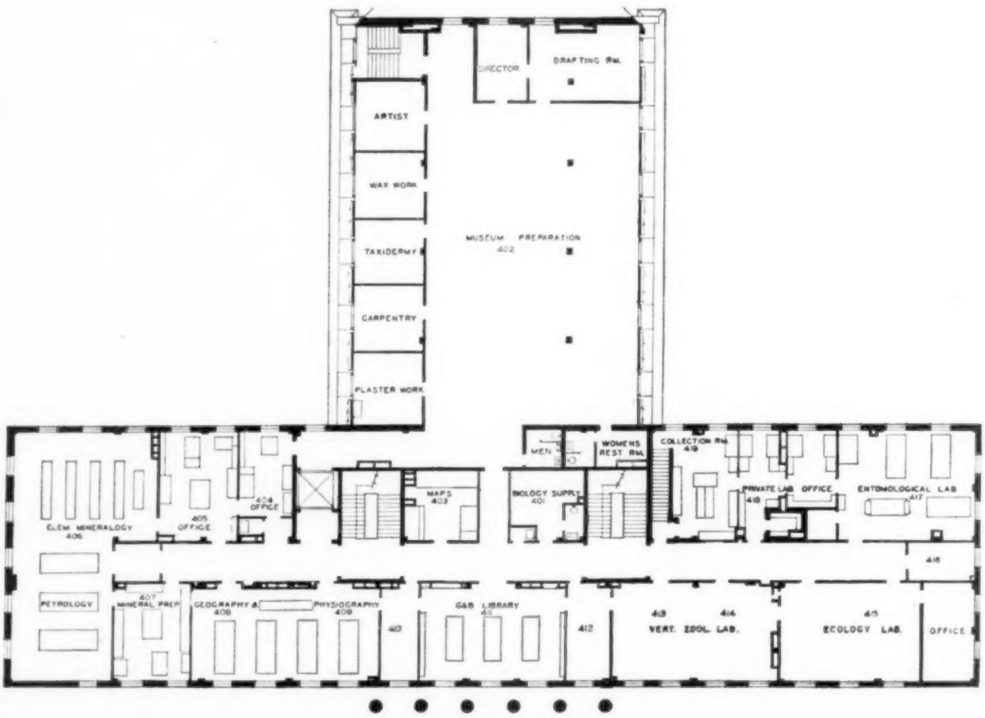
The museum space on the ground floor is used for general museum storage. An area about 25 feet wide, along the west side of this large room, is destined ultimately for advanced work in Botany, particularly in plant physiology.

The Greenhouse and Vivarium

The corridor leading from the main building to the Vivarium is fully enclosed and warmed. The rooms in the headhouse (outlined in black in the floor plan of the Greenhouse and Vivarium) will serve as special laboratories for instructors and advanced students investigating living ma-



THE MAIN PLAZA OF THE NEW CAMPUS OF THE UNIVERSITY OF ROCHESTER, LOOKING EASTWARD
Reading left to right, the five buildings shown are the Chemistry, Arts, Library, Physics, and Biology-Geology Buildings



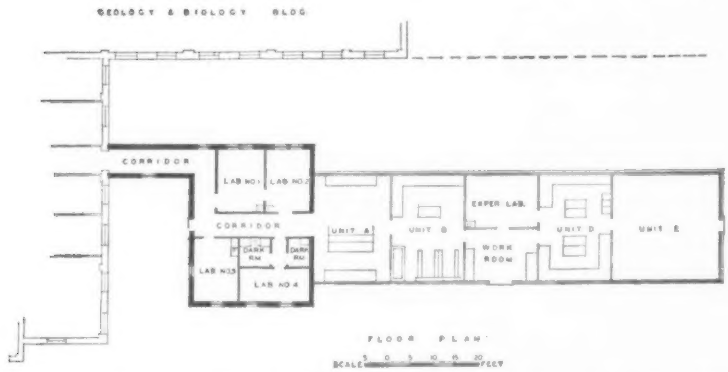
THIRD FLOOR PLAN

GORDON & KAELBER ARCHITECTS
ROCHESTER N.Y.

SCALE FEET
SCALE METERS

GEOLOGY AND BIOLOGY BUILDING
THE UNIVERSITY OF ROCHESTER
ROCHESTER N.Y.

FIRST FLOOR PLAN

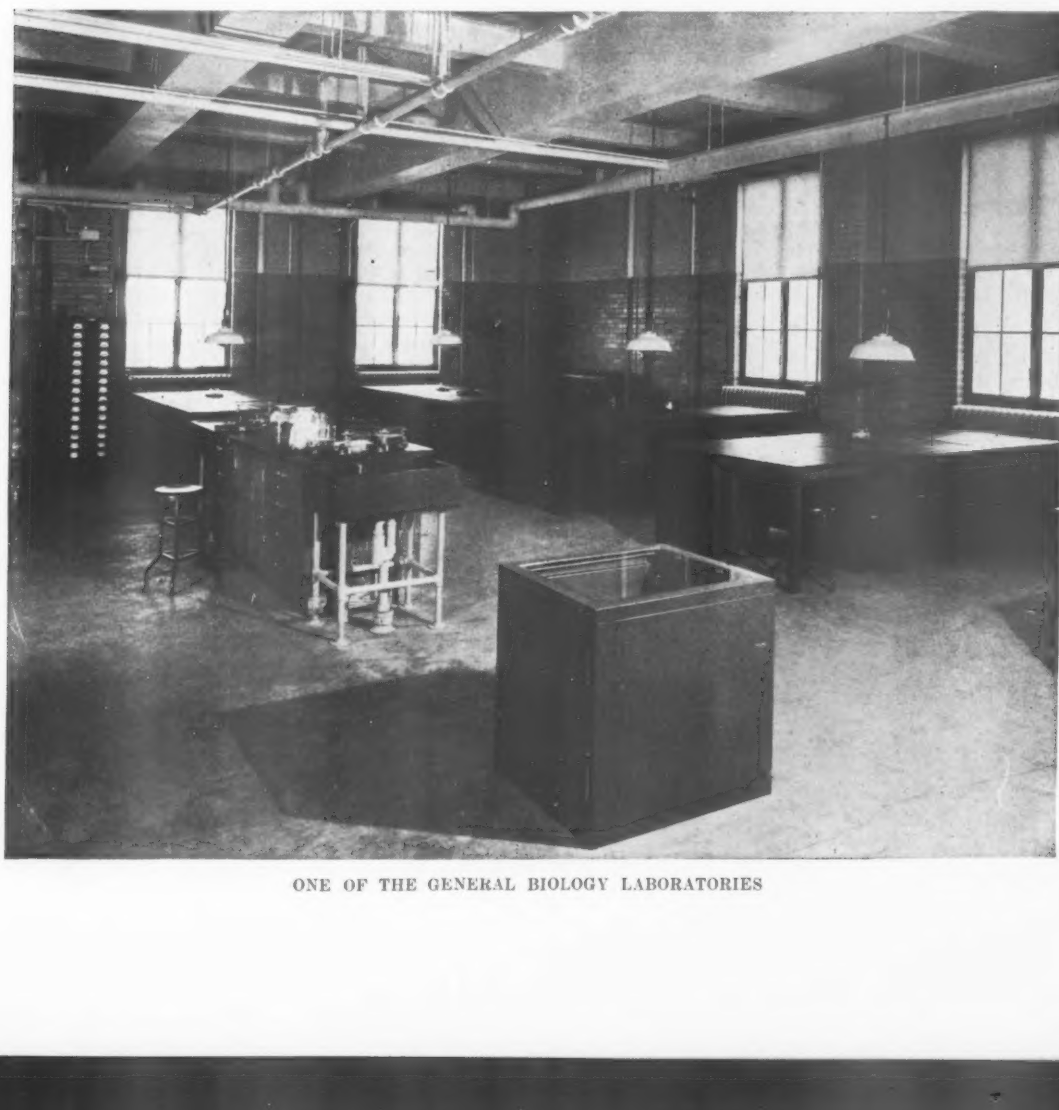


FLOOR PLAN OF THE GREENHOUSE AND VIVARIUM ADJOINING THE BIOLOGY WING

terial from the units of the glass houses. Everything beyond the headhouse is of standard greenhouse construction. Unit A is roofed with mottled glass, the other units with plain glass. Units A and B are equipped with a variety of tanks and pools with running water, for living animals. Unit C contains a room for rough work, and an experimental laboratory for plant physiology. Unit D has regular greenhouse benches, but unit E has a dirt floor for raising plants in quantity.

The General Biology Laboratories

The main floor contains two large laboratories for General Biology, each with a capacity of 30 students. At present only one of these has been equipped. The accompanying photograph shows part of the layout as seen on entering this room. Student tables are grouped by sixes opposite the large windows. The lumière over each window group is a special assemblage of standard units, giving ample light of daylight quality on dark days and at night. For students who are doing work with immersion lenses, individual lamps can be plugged in above the large reflector.



ONE OF THE GENERAL BIOLOGY LABORATORIES

THE GENERAL BOTANY LABORATORY

Other Equipment Illustrated in the General Biology Laboratory Photograph

In the foreground of this photograph is a steel exhibit case, with a series of drawers containing specimens belonging to the groups being studied. These drawers can be shifted up under the plate-glass top as different groups are studied.

At the extreme left of the photograph is one of the four steel locker-cabinets in this laboratory. Each cabinet contains 30 lockers or drawers, enough for one section. A student on entering takes his drawer to his table, slips it into the blank space there, and thus has his locker at his elbow while at work. At present four men use the same table on successive days. Each of the student tables has a microscope, which is kept in the table cupboard, and is safer for not being carried about the room. Expansion for another section involves merely an additional locker-cabinet.

The General Botany Laboratory

The photograph above shows the General Botany laboratory. The steel apparatus case in the farther corner is another standard unit. The tables are exactly like those in the Biology laboratory, with the addition of an individual bracketed lamp with a frosted blue bulb under an aluminum-finish reflector. Two sockets at the base of the upright allow for plugging-in individual microscope lamps, spot-lights, or any other light desired. All lamps are removable from the cross-arms.

Each table is wired separately, under the ledge at the back; the tables are connected by short couplers, and the wires finally reach a socket on the wall at the outer end of the row. All the table legs have adjustment bolts, so a table can be made absolutely steady. The steel-framed stools are adjustable. The microscope goes into the cupboard at the student's right, so we buy our new ones without the boxes. For quiz purposes the tables can be separated and spaced over the entire floor of the room.

The lighting scheme for this laboratory is a modification of that used at the University of Minnesota; the unit table idea came from a University of Chicago man; the locker cabinet was derived from Carleton College; the counter-balanced blackboard originated at the University

of California; and the lumières in the Biology laboratory were developed from a Western Reserve University lamp. So it will be seen that the Biology Department at the University of Rochester is cosmopolitan, claiming credit only for its adaptations and combinations of equipment.

The Second and Third Floors

Two more laboratories on the same general plan as those already described are located on the second floor, which also contains the departmental office and a recitation room seating 40 students. On the third floor are Vertebrate Zoological, Ecological and Entomological laboratories, four offices, a private laboratory, a Collection Room and (between the two wings) a joint Geology and Biology Library. So far as possible, the larger classes are taken care of on the lower floors, letting the more advanced students do the climbing and rewarding them with the greater degree of quiet.

The Equipment Is Durable and Standardized

In the Collection Room of the Entomology suite are insect cabinets, one of which is illustrated. A fireproof vault is provided for the safety of type specimens and other especially valuable material. The use of steel for all cabinets, herbarium cases, table frames, stools, etc., ensures durability and the possibility of exact duplication when more units are needed. All laboratories are equipped with the standardized units already described, the number and arrangement being easily fitted to the size of the room. The unit tables are being used in all combinations from one to six, according to present needs. With interchangeable tables, lockers and cabinets, and with all furniture units on one "Lab. Master" key, the entire equipment is perfectly flexible.

Other Practical Features of the Building

The arrangement of the coat rooms is borrowed from our own Chemistry Department. For reasons of safety, each group of laboratories has its coat room as a sort of anteroom, with its door in plain sight of those at work. With a buzzer on this outer door, any one entering the coat room will attract attention, and prowling will be effectually discouraged.

The office of each member of the staff is usually directly adjacent to his laboratory. By an inside stairway, materials can be carried from floor to floor without using the regular corridors. The building has one electric freight elevator, which is extremely useful. A large photography room on the ground floor is for the use of both the Biology and Geology Departments.

A GROUP OF INSECT CABINETS

The Future Has Been Considered

In planning and locating the buildings for the new Men's College, the trustees and the architects have provided for the future extension of every building, when the enrolment makes it necessary. The addition to the Biology-Geology building will take the form of an extension of the Museum southward and then two new cross-wings, one for each department. Thus all four wings, the old and the new, will be connected directly to the Museum, which is an adjunct to the teaching in all of them. When this addition is built, the present greenhouse will have become inadequate and will be removed, and an entirely new one will be placed on a new site.

The entire south end of the campus is to be developed as a botanic garden, informally landscaped, and devoted chiefly to native trees, shrubs, and all of the smaller plants that can be induced to grow there. Two large city parks, one adjacent to the campus and the other about a mile away, may also be used for field work by students in the Biology Department.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Acoustical Treatment—Insulite Co.
Auditorium Seating—American Seating Co.
Classroom Furniture—Indian Splint Co.
Cleaning Equipment—Spencer Turbine Co.
Clocks and Signal Systems—Hamilton-Sangamo Corp.; Graybar Electric Co.
Doors—Metal Door & Trim Co.; Art Metal Construction Co.
Exterior Building Materials—Indiana Limestone Co.
Heat Regulating System—Johnson Service Co.
Laboratory Furniture and Office Equipment—Yawman & Erbe Co.
Lighting Globes and Fixtures—Graybar Electric Co.
Lockers—Lyon Metal Products Co.
Window Shades—E. I. duPont de Nemours & Co.
Windows and Sash—Richey, Browne & Donald, Inc.

The Dispensing of Chemicals and Laboratory Apparatus at the University of Michigan

BY R. J. CARNEY

DIRECTOR OF THE CHEMISTRY STORE AND ASSISTANT PROFESSOR OF CHEMISTRY, UNIVERSITY OF MICHIGAN

THE purchasing and distribution of science laboratory supplies have in recent years become a formidable problem for large universities. The natural solution of this problem has been the installation of store systems. These have been developed in different ways, depending on local conditions, but all take advantage of quantity purchases and endeavor to distribute the material purchased as efficiently as possible to the individuals and departments using it. This article is concerned particularly with the development and operation of the scientific supply store at the University of Michigan.

A dispensing department under the direction of the Department of Chemistry had been in operation at the University of Michigan for many years. Its purpose was to dispense chemicals and apparatus to the faculty and students of the department. Records show that other departments had long been included in this service. By 1923 the requirements had become sufficiently large to justify the establishment of a separate business department known as the University Chemistry Store. A member of the faculty of the Department of Chemistry was placed in charge of the store, continuing, however, to maintain his connection with the teaching department. This direct connection between the instructional and business departments is an important factor in causing these two often conflicting university activities to operate in harmony for the good of the institution.

A DISPENSING ROOM IN THE CHEMISTRY BUILDING, UNIVERSITY OF MICHIGAN
Liquid chemicals are dispensed in unit quantities

The Function of the Chemistry Store Department

The Chemistry Store Department distributes supplies to the students and faculty of the Department of Chemistry and the College of Pharmacy, both located in the Chemistry Building, and to other departments, including University Hospital. It makes cash sales of certain supplies used in medicine and biology to students in those departments. It also operates an apparatus exchange for transferring used apparatus from one department to another.

The Store Department has dispensing rooms on each floor of the Chemistry Building, and storage rooms in the attic and basement. The basement storage rooms include two separate rooms, each equipped with sprinkler systems and explosion vents, for the storage of inflammable chemicals. In the larger room the chemicals are stored in their original drums, and in the smaller room are kept bottles and cans of inflammable material. No container is ever opened in the room housing the large stock; the drum is transferred to another room for this purpose.

ADJUSTABLE STEEL SHELVING IS USED IN THE WHOLESALE CHEMICAL ROOM AT THE UNIVERSITY OF MICHIGAN

A separate basement room, entirely apart from the inflammable chemical stock-rooms, is used for the storage of acids and corrosive volatile chemicals. In case of a fire elsewhere, chemicals of this kind are not present in any quantity to interfere with the work of extinguishing it. It is too commonly the practice to store these two classes of chemicals together.

A glassblowing room is provided with graduating, engraving and grinding machines. No attempt is made to compete with commercial glassblowing shops in making routine apparatus. The glassblower devotes all of his time to the making of special apparatus and the repairing of broken material. A washing room, equipped with a steam-jacketed chromic acid pot, albarene stone tubs, and a gas-heated drier, is in constant use.

The Distilling of Water and Alcohol

Distilled water is supplied by two large steam-heated stills which discharge into a large reservoir, from which the water is piped to all parts of the Chemistry Building. Distilled water in unit lots of five gallons is delivered to other departments if their consumption is too small to warrant their having a still or if they wish to avoid the labor of taking care of it. Redistilled water is also available at any time.

The Chemistry Department manufactures most of the absolute alcohol used in the University. This operation is not so profitable as it was formerly, owing to the recent reduction in the price of the chemical. It is doubtful whether it would pay to install a still for the production of absolute alcohol at the present time, but in the past ten years the distilling outfit has paid for itself many times.

A SECTION OF THE GLASSBLOWER'S ROOM IN THE CHEMISTRY BUILDING

The Purchasing of Science Supplies

The purchasing of supplies is in the hands of an efficient Univer-

sity Purchasing Department, which works in active cooperation with the supply store. The excellent results of this cooperation were apparent almost from the beginning. Through this combination of business experience, knowledge of apparatus and intimate association with the actual users of material, it is possible to purchase supplies which are really suitable for the purposes for which they are intended. The purchasing of unsuitable material, even at a low price, usually through the arbitrary attitude of an official, is one of the most common sources of waste in a university.

As a result of the cooperation between the business and instructional departments, careful consideration can be given to both quality and price, thus placing the emphasis on value, where it should be placed. It would be more difficult to apply such a criterion if the usual method were employed of purchasing a heterogeneous lot of material on an annual list. Owing to the introduction of the store system, the University of Michigan is able to use the more effective method of purchasing supplies throughout the year in the quantities required to replenish depleted stocks. A sufficiently limited number of items of the same general classification may be purchased at one time to permit careful selection and examination. Samples are obtained frequently and examined. This method is often more successful than are attempts to write rigid specifications. Too exact specifications may in some instances defeat their own purpose by excluding desirable items.

While the store is the valued customer of several of the better laboratory supply companies, there are evidently certain materials which large consumers can obtain to better advantage directly from the manufacturer. While this is a controversial subject which cannot be discussed fully in this article, it may be said that some of the more progressive supply companies are fully in sympathy with this point of view. The purchasers of apparatus would be better served by a few prosperous companies carrying large stocks than by the large number of concerns existing at present, some of which have done little to justify their existence.

The Sale of Supplies to University Departments

The store system has the advantage of permitting representatives of the University departments to personally select the material they wish to purchase. Many such customers at the University of Michigan do this daily. The central location of the store is a decided advantage. When material is thus purchased, a record is made on a "Chemistry Store Requisition," which may be handed directly to a clerk, sent in by campus mail or recorded from an order by telephone. If a requisition for apparatus or chemicals is first sent to the Purchasing Department, it is there transferred to an "Interdepartment Requisition," which is then sent to the Chemistry Store.

The charges against the various departments are billed at regular intervals, the amounts being then deducted from the budgets of the consuming departments and credited to the budget of the Chemistry Store.

When the material is not taken away by the customer, it is delivered by a University delivery service operated by the general store. Frequent deliveries on regular schedules enable departments to obtain their supplies promptly. A "Delivery Ticket" system furnishes a necessary check on the promptness and reliability of these deliveries.

It has been said that some institutions hesitate to introduce an apparatus store system because of the fear of lack of cooperation on the part of the instructional departments. While this was a problem to a certain extent during the early days of the University of Michigan Chemistry Store, it is no longer a matter of importance. If the store makes a sincere attempt to supply exactly the material wanted, and does not attempt to force the consumer to accept a substitute, fine cooperation will eventually be obtained.

Dispensing Supplies to Students and Teachers

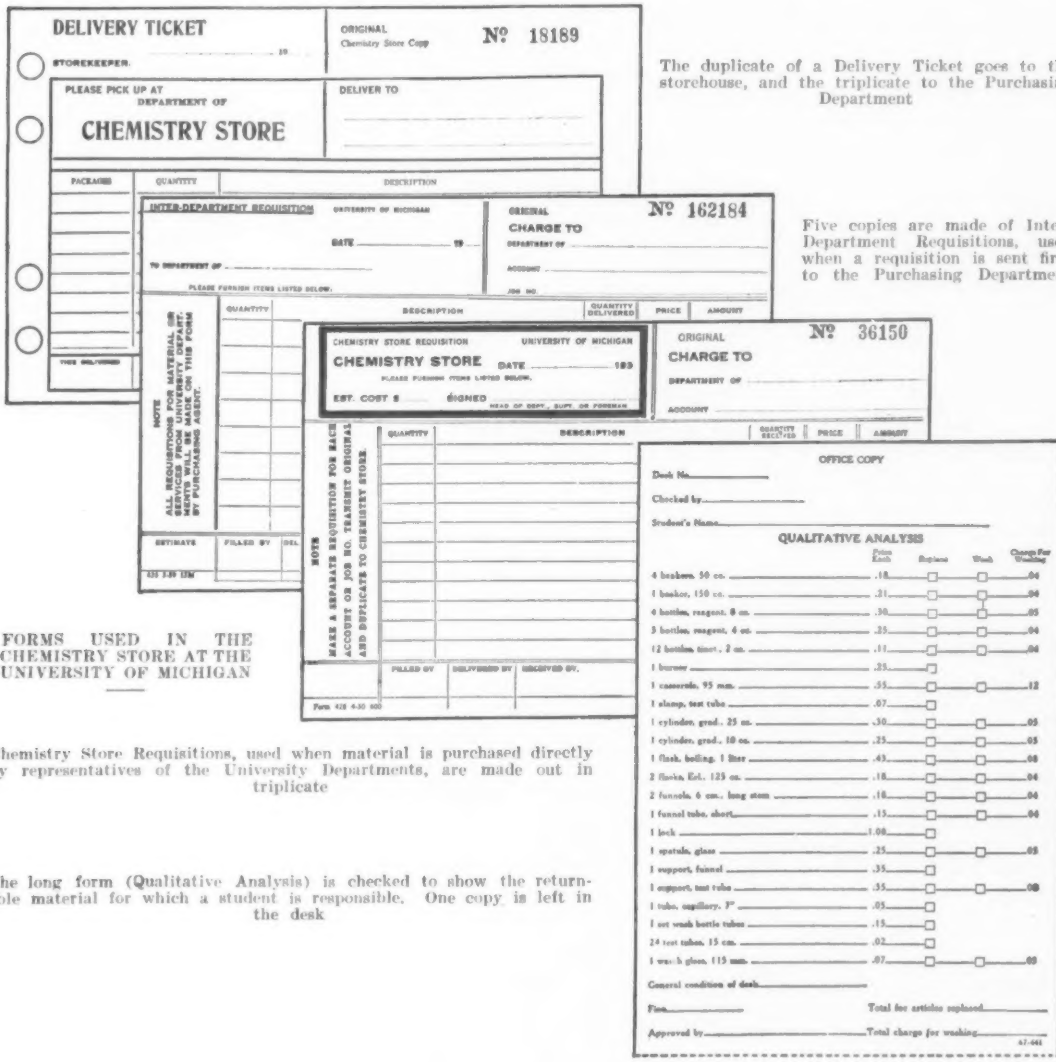
The Chemistry Store budget is arranged to include the routine supplies used by the occupants of the Chemistry Building. The special, more expensive apparatus is covered by departmental budgets. This arrangement insures an unfailing supply of the necessary routine apparatus and chemicals, regardless of the time that has elapsed since the previous appropriation.

Records of material withdrawn from stock or returned for credit are made on sales book slips. These sales books are of the same nature as those used by nearly all stores. They form an inexpensive and satisfactory record. The customer is given the duplicate and a filing envelope in which they may be kept. These duplicate credit memoranda are especially important, as they eliminate disputes about the return of material.

The Students' Contact with the Store

The student is required to make an appropriate deposit at the beginning of his course. This is accomplished by his purchasing a certain number of $5 coupons, which are not transferable. The coupons are used throughout the semester in purchasing non-returnable material. Returnable material is never sold in this way. Such a policy enables the regulation to be enforced that credit is not issued for items unless a corresponding charge slip appears in the student's account.

The student finds an outfit of returnable material in his desk at the beginning of the semester. The necessary non-returnable material is put up in kits which are sold to the student at a dispensing room. At the end of the semester the desk is checked by experienced employees using sales book forms. The original is sent to the office and becomes part of the student's record, and the duplicate is left in the desk, where it is used as a record



DELIVERY TICKET

STOREKEEPER. ______ 19__

ORIGINAL Chemistry Store Copy Nº 18189

PLEASE PICK UP AT DEPARTMENT OF CHEMISTRY STORE

DELIVER TO

PACKAGES | QUANTITY | DESCRIPTION

INTER-DEPARTMENT REQUISITION UNIVERSITY OF MICHIGAN

DATE ______ 19__

TO DEPARTMENT OF ______

PLEASE FURNISH ITEMS LISTED BELOW.

ORIGINAL Nº 162184

CHARGE TO DEPARTMENT OF ______ ACCOUNT ______ JOB NO.

QUANTITY | DESCRIPTION | QUANTITY DELIVERED | PRICE | AMOUNT

NOTE ALL REQUISITIONS FOR MATERIAL OR SERVICES FROM UNIVERSITY DEPARTMENTS WILL BE MADE ON THIS FORM BY PURCHASING AGENT.

ESTIMATE | FILLED BY | DEL

CHEMISTRY STORE REQUISITION UNIVERSITY OF MICHIGAN

CHEMISTRY STORE DATE ______ 193

PLEASE FURNISH ITEMS LISTED BELOW.

EST. COST $ ______ SIGNED ______ HEAD OF DEPT., SUPT. OR FOREMAN

ORIGINAL Nº 36150

CHARGE TO DEPARTMENT OF ______ ACCOUNT ______

QUANTITY | DESCRIPTION | QUANTITY RECEIVED | PRICE | AMOUNT

NOTE MAKE A SEPARATE REQUISITION FOR EACH ACCOUNT OR JOB NO. TRANSMIT ORIGINAL AND DUPLICATE TO CHEMISTRY STORE.

FILLED BY | DELIVERED BY | RECEIVED BY

OFFICE COPY

Desk No.______

Checked by______

Student's Name______

QUALITATIVE ANALYSIS

	Price Each	Replace	Wash	Charge For Washing
4 beakers, 50 cc.	.18	☐	☐	.04
1 beaker, 150 cc.	.21	☐	☐	.04
4 bottles, reagent, 8 oz.	.30	☐	☐	.05
3 bottles, reagent, 4 oz.	.25	☐	☐	.04
12 bottles, tinct., 2 oz.	.11	☐	☐	.04
1 burner	.25	☐		
1 casserole, 95 mm.	.55	☐	☐	.12
1 clamp, test tube	.07	☐		
1 cylinder, grad., 25 cc.	.30	☐	☐	.05
1 cylinder, grad., 10 cc.	.25	☐	☐	.05
1 flask, boiling, 1 liter	.43	☐	☐	.08
2 flasks, Erl., 125 cc.	.18	☐	☐	.04
2 funnels, 6 cm., long stem	.18	☐	☐	.04
1 funnel tube, short	.15	☐	☐	.04
1 lock	1.00	☐		
1 spatula, glass	.25	☐	☐	.05
1 support, funnel	.35	☐		
1 support, test tube	.35	☐	☐	.08
1 tube, capillary, 7"	.05	☐		
1 set wash bottle tubes	.15	☐		
24 test tubes, 15 cm.	.02	☐		
1 watch glass, 115 mm.	.07	☐	☐	.03

General condition of desk______

Fine______ Total for articles replaced______

Approved by______ Total charge for washing______

The duplicate of a Delivery Ticket goes to the storehouse, and the triplicate to the Purchasing Department

Five copies are made of Inter-Department Requisitions, used when a requisition is sent first to the Purchasing Department

FORMS USED IN THE CHEMISTRY STORE AT THE UNIVERSITY OF MICHIGAN

Chemistry Store Requisitions, used when material is purchased directly by representatives of the University Departments, are made out in triplicate

The long form (Qualitative Analysis) is checked to show the returnable material for which a student is responsible. One copy is left in the desk

of the material which must be added by the employee to make the desk outfit complete.

The student records are filed in folders in filing cabinets. The proper debits and credits are posted on ledger cards which become a permanent record. At the end of the semester any balance due the student is refunded, or he is sent a notice of his indebtedness if he has overdrawn his account.

The Sale of Used Apparatus

The Store Department acts as a medium for the sale of used apparatus by one department to another. Every university has a considerable investment in apparatus which is no longer used to any extent by the department for which it was purchased. It is possible that new apparatus of the same kind may be purchased for another department while these pieces of equipment lie inactive. In order to make it advantageous for each department to dispose of such material, the apparatus store is authorized to sell it to other departments and credit the proceeds to the department disposing of it. Often parts of obsolete equipment are useful in building new apparatus. For example, an old arc projector was sold piece by piece by the store. The lens proved useful to one department, the slide carrier to another, and the water cell was just what one individual needed in constructing a new outfit of an entirely different nature. Although this activity has not as yet been carried on to the extent that it should be, it will eventually prove to be an important measure of economy for the University.

Planning Rooms for General Science Courses in High Schools

BY RALPH EVANS HACKER
HACKER & HACKER, ARCHITECTS, FORT LEE, N. J.

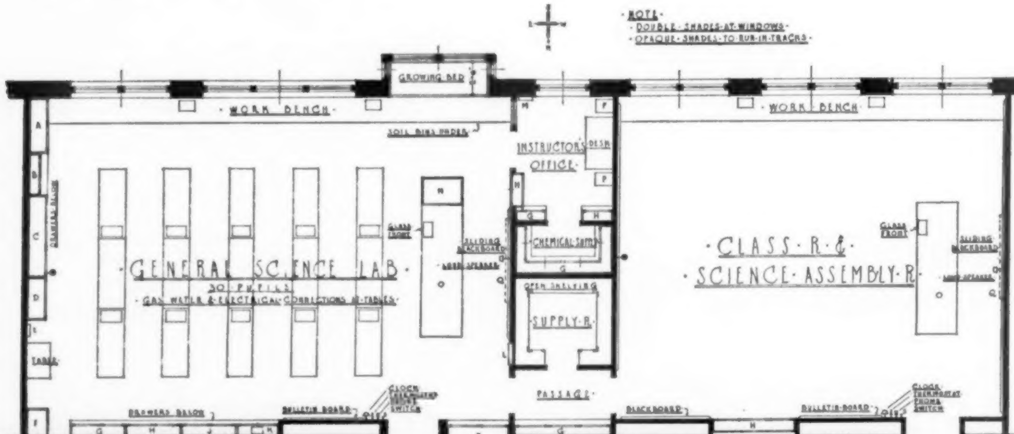
MANY different types of plans may be worked out for general science departments in high schools. They all, however, should take into consideration the ever increasing demand for practical work in applied science. Adequate facilities should be provided to stimulate interest on the part of the pupils and to encourage them in constructive work. As far as possible all the science materials should be within reach. These materials must be provided generously, yet without waste or unnecessary duplication.

In a general science room, the common laboratory tools and supplies should be independent of the storeroom and should be conveniently placed in accessible cases along the walls. This arrangement gives students an opportunity to use the materials at will. If the activity of the individual is to be stressed and his hobbies are to be encouraged, books, microscopes, work bench and tools must be so arranged that the class and the creative student will not interfere one with the other. Besides content, other important factors to consider in planning rooms for science departments are the size of the classes, pupil-week periods and methods of instruction. The architect must comprehend the minimum and maximum of laboratory possibilities and be guided by the school district's financial limitations.

The plans shown in this article have been developed to conform to the views of various well-known general science instructors. Plans on the order of type D have the greatest number of supporters in the eastern states and the Middle West, while on the Pacific Coast the tendency is toward plans of the C type. A brief description of the plan follows:

With Plan A, the laboratory may be used not only for group work but also for demonstration, recitation, discussion and individual laboratory work. The science assembly room and classroom is also equipped with a demonstration table and is accessible to the laboratory supply room. With this layout it is possible to accommodate a few extra periods of general science in the assembly room when the enrolment is too large for the laboratory but too small to warrant two laboratories. The assembly room may be used for other class purposes during vacant periods. If the enrolment is sufficiently large, both rooms may be used continuously for general science, with demonstration-recitations in the science assembly room, and laboratory exercises in the laboratory. One of the main reasons given for favoring this plan is that it accommodates the maximum number of students for the floor space with a minimum number of teacher periods.

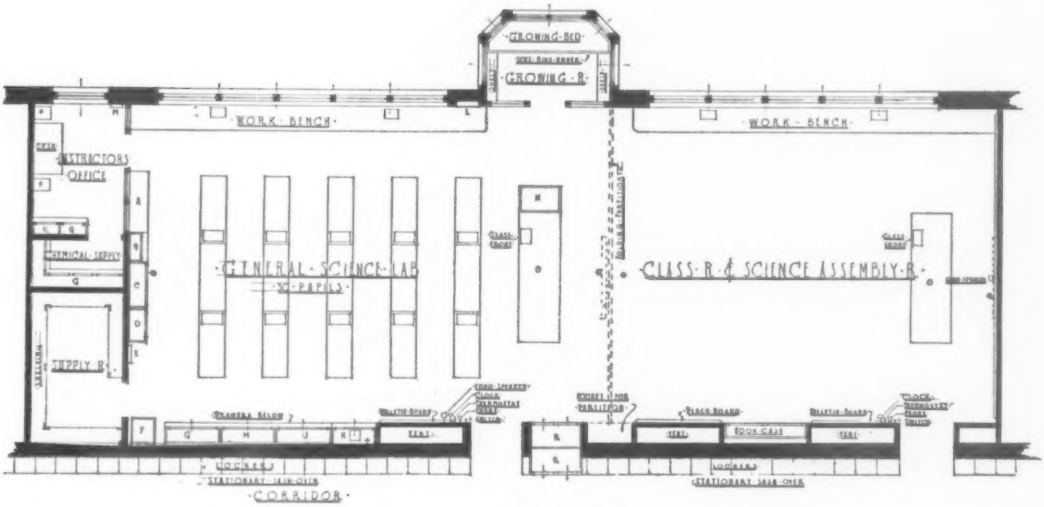
Plan B is similar to Plan A except for the fact that the two rooms may be thrown into



· PLAN ·A· ·

Hacker & Hacker, Architects

The dimensions of the laboratory are 23′ 0″ x 35′ 6″, and the assembly room is 23′ 0″ x 28′ 6″. In the case of these rooms and the others shown in Plans B, C, D and E, the dimensions may be decreased to some extent or increased as cost may necessitate or permit.
See Plan C for an explanation of the letters used to indicate the location of equipment in the five plans. The orientation sign shown in Plan A also applies to the other four plans.



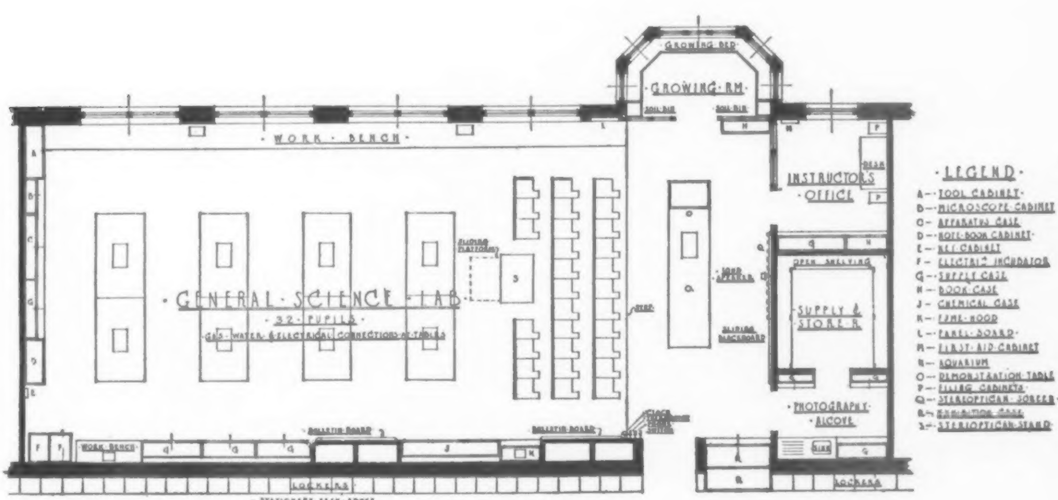
· PLAN ·'B'

The laboratory is 23′ 0″ x 35′ 6″, and the assembly room is 23′ 0″ x 28′ 0″.

one, and the floor space of the science assembly room can be used for exhibitions, floor map work, etc. The supply rooms must of necessity be placed in the rear of the laboratory. In this position they are not so convenient to the instructor's desk or to the science assembly room.

Plan C provides for water, gas and electricity at each table, with units of four students working at a table. The tables may be separated if desired. Fixed plumbing and electricity connections, however, eliminate flexibility in the use of the room that may be desirable if classes vary in size from year to year, or if floor space is wanted for exhibition purposes, etc. The inclusion of work shelves means that larger classes than were originally intended can be accommodated. Class conferences may be held by grouping chairs together in the front of the room. The floor space required per student for Plan C is greatly in excess of that required for any of the other plans.

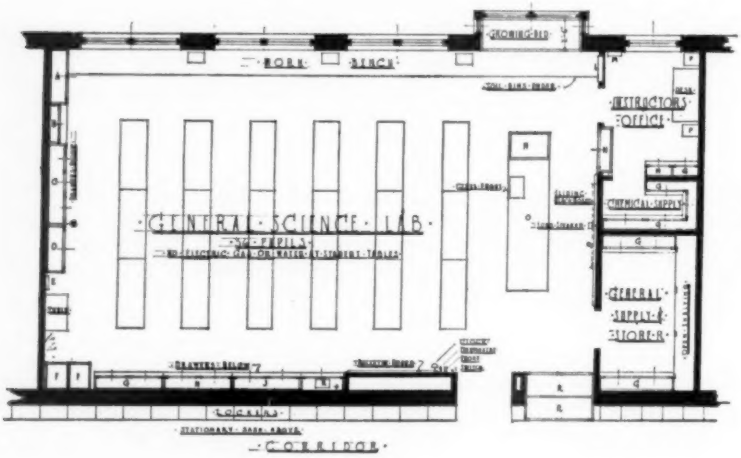
Plans D and E vary principally in the number of students that may be accommodated and in the accessory rooms provided. Plan E is obviously designed for a school of smaller enrolment than Plan D, and economies are effected by eliminating



· CORRIDOR ·

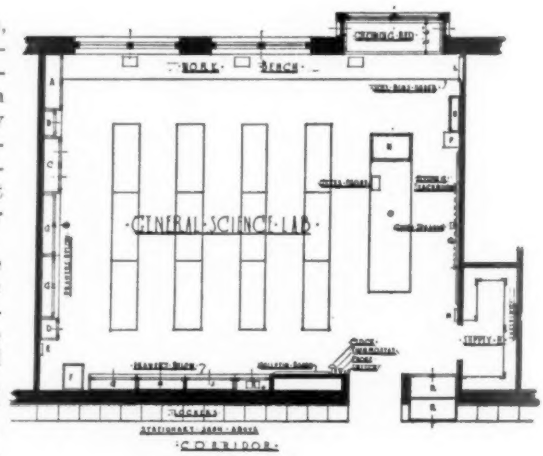
· PLAN ·'C'·

This room is 23′ 0″ x 55′ 6″.



· PLAN D ·

THE LABORATORY SHOWN IN PLAN D IS 23′ 0″ X 40′ 6″; THAT IN PLAN E IS 23′ 0″ X 30′ 6″.



· PLAN E ·

the instructor's office and chemical supply room, which in the smaller schools may be done without any serious disadvantage. Each plan provides gas, water and electricity at the work bench and instructor's table only. This is generally conceded to be ample provision, as it rarely happens that a whole class is doing the same experiment at the same time. Each plan permits great flexibility in class size and the use of the floor space.

If the table sinks and fixed connections were eliminated from Plans A and B, they would be very similar to Plan D. The classroom and science assembly room may be equipped to be of the same type as Plan D, or movable desks and chairs, tablet arm chairs, or similar equipment, may be used, thus accommodating a greater number of students but permitting the same use of this room for laboratory or demonstration work.

Equipment for School Science Rooms

BY SAMUEL RALPH POWERS

PROFESSOR OF NATURAL SCIENCE, TEACHERS COLLEGE, COLUMBIA UNIVERSITY, NEW YORK CITY

AND

J. G. MANZER

STATE TEACHERS COLLEGE, EAST STROUDSBURG, PA.

EQUIPMENT for science laboratories in elementary schools and in junior and senior high schools must be justified by the use that is to be made of it. With this point of view, graduate students have approached the question of desirable equipment for elementary school and junior high school science and high school biology rooms. The following recommendations have been prepared by graduate students in science education at Teachers College, Columbia University, as part of the course work.

EQUIPMENT FOR AN ELEMENTARY SCIENCE ROOM *

These recommendations for an elementary science laboratory are made to accord with the following criteria:

a. The science room should be the source from which each classroom may obtain materials, equipment, ideas and experiences appropriate for the science instruction in that classroom.

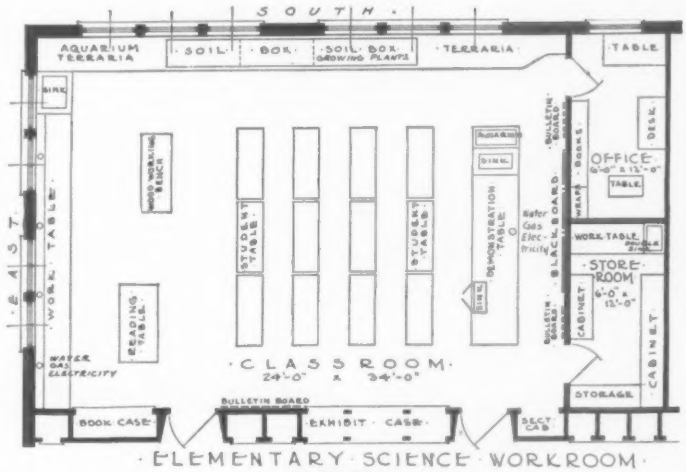
* By Leona Sundquist, State Teachers College, Bellingham, Wash. The equipment suggested has been used to advantage in the elementary science work at one or more of the following schools: The Lincoln School of Teachers College, and The Horace Mann School of Teachers College, Columbia University; The Training School, Washington State Normal School, Bellingham, Wash.

b. The science room should provide those experiences in science which cannot conveniently or adequately be provided in the ordinary classrooms.
c. The science room should be a workshop for projects carried on by the individual child.
d. The science room should be a workshop for the science supervisor and for room teachers.
e. The science room should provide for the display of museum material including the products of children's and teachers' activities which have educational value.
f. The equipment and materials should be selected so as to cover a wide range of science interests.

List of Equipment

1. A demonstration desk, 12′ 0″ x 3′ 0″, 34″ high; with soapstone sinks, one with a cover and glass side open to the front; provision for two upright steel rods; water, gas and electricity connections; closets and drawer space; and a glass aquarium at one end.
2. Movable student tables, 4′ 6″ x 20″, of three heights (24″, 25″ and 26″), with an open shelf 4″ below the top. Chairs 11″ lower than the tables should be provided, two chairs to each table.
3. A movable woodworking bench, with a vise and adequate storage space beneath.
4. A wall shelf, 27″ wide and 30″ high, along the southern wall; to hold a lead-lined soil box, 10″ deep, as wide as the shelf and flush with it, with water and drainage connections and movable partitions to allow for habitat planting, etc. Underneath is space for cupboards and radiators. There should also be a window shelf, 15″ wide, with a metal tray 3″ deep, placed 2′ 6″ above the wall shelf, the full length of one side of the room.
5. A work table, 27″ wide and 30″ high, along one end of the room; with a soapstone sink; water, gas and electricity outlets every 6 feet; and drawer and cupboard space beneath. All cupboards should have a 4″ inset at the bottom, to give space for the pupils' feet.
6. An exhibit case, built in the wall and extending nearly to the floor; with adjustable glass shelves and artificial lighting.
7. A built-in bookcase, with adjustable shelves, 10″ wide, the lower section adapted for charts, pictures, pamphlets, etc.
8. A built-in sectional cabinet, for the convenient and accessible storage of small articles.
9. Biological materials such as aquaria, breeding cages, bird charts, a microscope, fish net, flower pots, etc.
10. Physical science materials such as collections of rocks and minerals, barometers, an air pump, prisms and lenses, magnets, dry cells, tuning forks, chemicals, etc.
11. General laboratory equipment such as glassware, ring stands, bunsen burners, tools, rubber tubing, etc.

The storeroom, 6′ 0″ x 12′ 0″, may be used as a dark-room.



ELEMENTARY SCIENCE WORKROOM
5 FEET

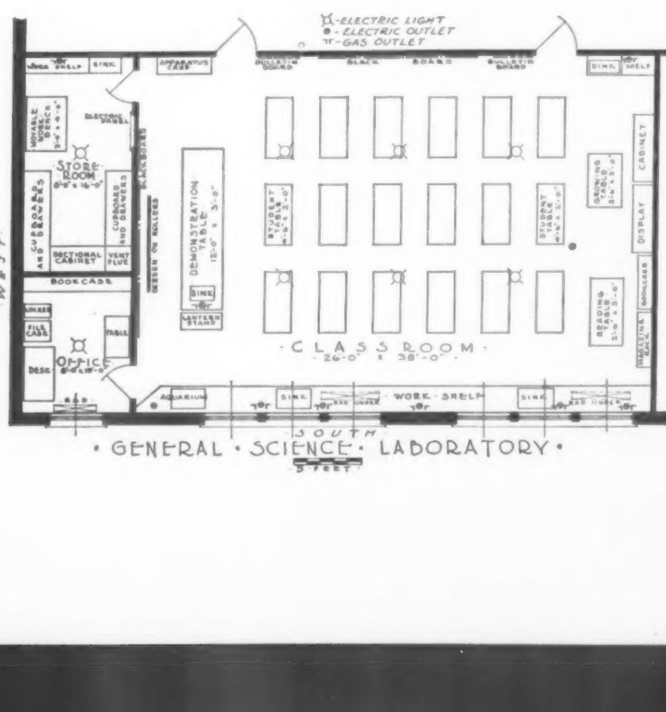
It should have shelves along the sides of the room as well as cupboards for large equipment, and a work table with a soapstone sink, water, gas and electricity connections, and storage space beneath.

The office, 6′ 0″ x 12′ 0″, should contain a desk or table for the supervisor, a table and chairs for conferences, a bookcase, etc.

The three plans presented in this article indicate recommended locations for the equipment described. They were drawn in an effort to meet optimum demands for science teaching, and may be readily modified as conditions require.

EQUIPMENT FOR A GENERAL SCIENCE LABORATORY IN A JUNIOR HIGH SCHOOL *

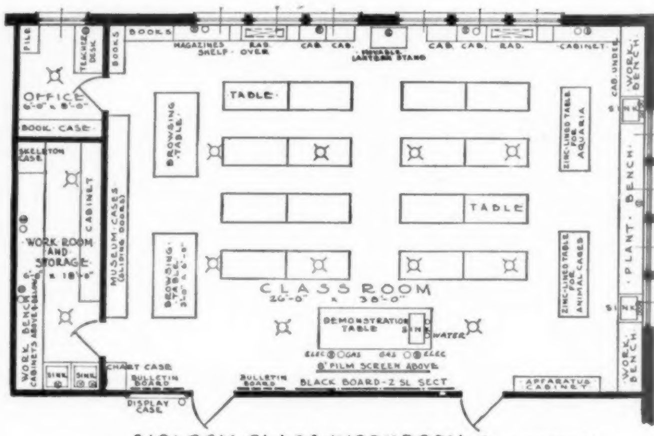
1. A demonstration table, standard type, 12′ 0″ x 3′ 0″, 3′ high, with a covered sink and gas, water and electricity connections.
2. 18 movable student tables, 4′ 6″ x 2′ 0″, 29″ high, each accommodating two pupils. These tables should have an open shelf 5″ below the top, and should be heavy enough not to be easily moved. Chairs with the seat 17½″ from the floor, and a foot rest in front, should also be provided.
3. A workshelf, 24″ wide and 33″ high, the full length of the window side of the room; with drawers or closets beneath, at each end of the room, and radiators between.
4. Display cabinets of standard type.
5. A bookcase, 5′ 0″ x 1′ 0″, 6′ high, with adjustable shelves and glass doors. There should also be a magazine rack similar in size.
6. A reading table, 2′ 6″ x 5′ 0,″ 29″ high, and chairs.
7. A growing table, 26″ x 30″, 27″ high, with a sunken top lined with zinc. This may be used as a growing table when biological work is to be done, or as a sand or soil box when physiographic forms are to be demonstrated, or as a container for rocks and other materials that injure wooden table tops.
8. Three sinks, two of soapstone and one of porcelain, each 30″ x 18″, 8″ deep. The two soapstone sinks should be in the workshelf, and the other should be near the back corner of the room, near the corridor side.
9. An electric panel, providing (1) separate control of the electrical supply to the demonstration table, wall shelf and shelf in the rear corner; (2) a variable rheostat; (3) direct current available from motor generator or from batteries.



• GENERAL • SCIENCE • LABORATORY •
5 FEET

*By G. Marjorie Dean, Franklin Junior High School, Highland Park, N. J.

10. Projection apparatus: a lantern of good quality, with a micro-projection attachment; a movable lantern stand; a screen on a roller above and behind the demonstration table; and a movable, translucent screen.
11. Window shades: (a) translucent, rolling up and down from the middle of the window; and (b) opaque, fitted to darken the room for projection.
12. Blackboards: one 8' board on the corridor side of the room, and one 12' slate board back of the demonstration table. (If more blackboard space is required, sliding boards to cover the stationary board, or to slide up above it, are practical.)
13. Two bulletin boards on the corridor side of the room, one on each side of the blackboard.
14. An apparatus case with glass sliding doors and shelves in the upper part and a projecting sectional cabinet below.
15. An aquarium, with running water and drainage, on the workshelf opposite the end of the demonstration table.
16. Small balanced aquaria; terraria; vivaria. These may be placed on the workshelf or the growing table. The tools and materials needed for the care of the aquarium and for the soil and the care of the biological material may be kept in the drawers and bins below the aquarium.



BIOLOGY CLASS-WORKROOM (FOR TENTH GRADE)

5 FEET

The office, 8' 0" x 10' 0", is furnished for ease in planning work, with a desk and a table, filing cabinet, bookcase, three chairs, and a light of the same type as those in the classroom. There is a locker for personal belongings.

The storeroom, 8' 0" x 16' 0", contains, besides storage space, facilities for preparations, as well as a movable woodworking bench, a wall shelf and a sink. The electric panel is accessible from this side also. The room can be used as a dark-room if required. It has a light of the same type as the classroom.

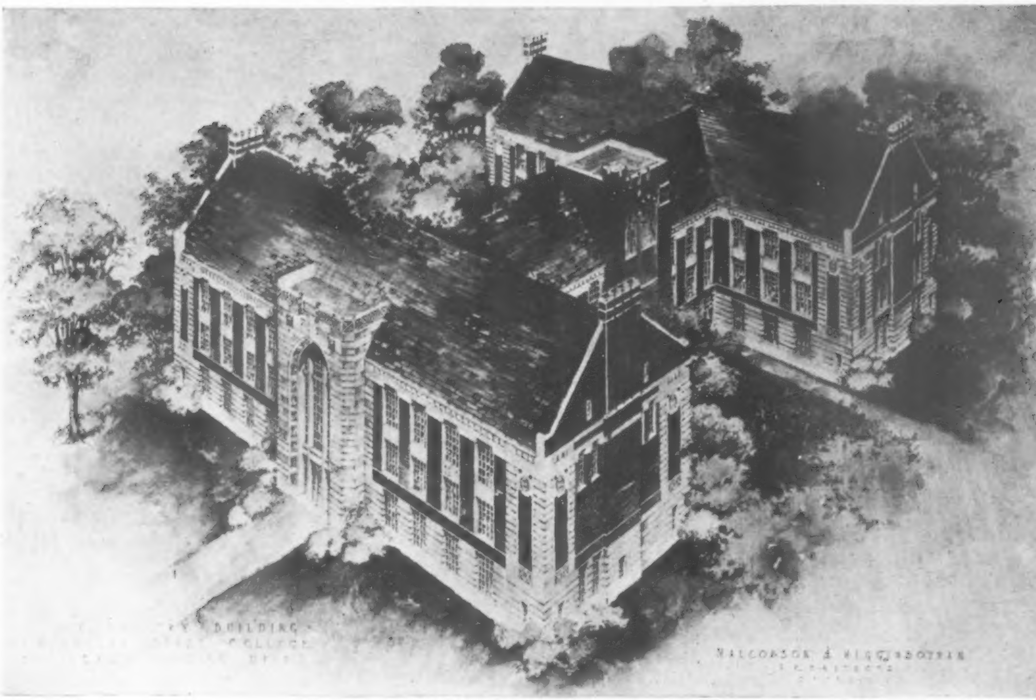
EQUIPMENT FOR A HIGH SCHOOL BIOLOGY CLASS-WORKROOM *

1. A demonstration desk of standard type, 8' 0" x 3' 0", 34" high, with a soapstone sink, closet and drawer space, and water, gas and electricity connections.
2. Movable student tables, 4' 6" x 2' 0", 30" high, with an open shelf 6" below the top. Each table should have two chairs.
3. Two browsing tables, 6' 0" x 3' 0", 30" high, each with a heavy movable glass top and shelf underneath. Each table should have six chairs.
4. Two carting tables, 6' 0" x 2' 0", 30" high, each with a zinc-lined top, 3" deep, and a drain and plug; a shelf beneath; and large rubber-tired casters. These tables may be used to move or to display exhibits of animal or plant life.
5. A good quality lantern, with a micro-projection attachment; a movable lantern stand, 39" x 18", 50" high, with drawers for slides and shelves; a screen on a roller above and behind the demonstration desk; and a movable translucent screen. The windows should be fitted with opaque shades.
6. An apparatus cabinet, 6' 0" x 1' 0", 6' high, with adjustable shelves.
7. Museum cases of standard type, with sliding glass doors.
8. A chart case, bookcase, display case, blackboard, bulletin boards, etc., located as shown in the accompanying plan.
9. A plant bench, 12' 0", x 2' 0", 8" deep, along the southern wall, with an electrical outlet, drains into the sink at either end. Water is at the sinks. The remainder of the space along the southern wall is occupied by work tables, 2' wide, with storage space beneath.
10. Two wall shelves along the eastern wall, 12" wide, with soapstone tops and gas and electricity connections. Radiators and storage space are underneath.

The storeroom, 18' 0" x 6' 0", contains a double sink, a work bench, 16' 0" x 2' 0", provided with gas and electricity connections, and storage cabinets above and below, as well as a skeleton case, 2' 0" x 2' 0", 6' high, and storage cabinets for materials that have little display value.

In the office, 8' 0" x 6' 0", are a desk, a bookcase, a filing cabinet, etc.

* By Crystal Finley, Kalamazoo High School, Kalamazoo, Mich.



THE CHEMISTRY BUILDING AT MICHIGAN STATE COLLEGE, EAST LANSING

The Kedzie Chemical Laboratory, Michigan State College

BY ALEX L. TROUT

MALCOMSON & HIGGINBOTHAM & TROUT, ARCHITECTS, DETROIT

THE unique features of the Kedzie Chemical Laboratory at Michigan State College are a logical outgrowth of the teaching program. Professor Arthur T. Clark, head of the Department of Chemistry, in seeking to work out certain desired educational objectives, suggested to the architects an interesting plan, which in the completed building has worked out satisfactorily.

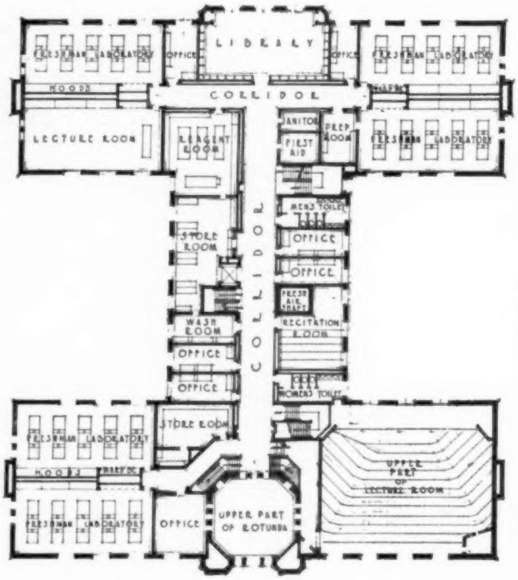
The college, located at East Lansing, Mich., is mainly an undergraduate institution. A very large percentage of the students take at least a year of chemistry, which is basic to the work in agriculture, engineering and home economics. Research work is confined largely to members of the staff, and to a few graduate students, whose numbers, however, are constantly increasing. To provide for the thorough training of students in large numbers was therefore a primary requisite in planning the laboratory. Available funds were limited, and while the building as planned is arranged for future extension, it seemed desirable to provide for as widespread and efficient use as possible.

Planned to Facilitate Teaching

Many of us in recalling our undergraduate days remember spending hours in the chemical laboratory, during a good part of which we were waiting to get hood space or were hampered by the need of additional burners. In one semester the quantitative laboratory would be overcrowded, while the qualitative laboratory was deserted. Classes in large sections made individual instruction difficult, and apparently little thought was given to the value of the students' time. The building failed to contribute to effective teaching.

With these recollections in mind, the architects received Professor Clark's suggestions with enthusiasm. The first suggestion was that the laboratories be limited to thirty students, the maximum number that can be taught effectively at one time. Laboratories of this size (24 x 46 feet) are not unwieldy if it is desired to arrange them for small groups of graduate students working on research problems. To make the building

as flexible as possible, the twenty laboratories were arranged on a unit plan, each equipped to handle students in one of several courses, making the variations in courses from one semester to another easy of adjustment. Ample hood spaces, and ample connections for gas, water, compressed air and steam, were arranged, as well as a convenient system for distributing distilled water.



THE THIRD FLOOR PLAN

The Advantages of the Open Plan

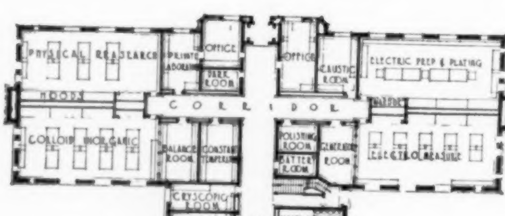
To further economize students' time, supply rooms should be conveniently located at central points. This had suggested the "H" plan to Professor Clark, and the idea was welcomed by the architects. Open planning has not yet received the encouragement in general college planning which it deserves. The open-type plan is increasingly being made use of in hotel planning and for apartment houses, but our colleges cling to the traditional quadrangle.

An inspection of the plans as presented will indicate the advantages of the "H" plan. It allows abundant light and cross circulation of air in each laboratory. While natural circulation of air is not relied on for ventilation, it is nevertheless desirable, particularly in summer when it helps do away with the clinging odors which are troublesome in a chemical laboratory, no matter how efficient the ventilation.

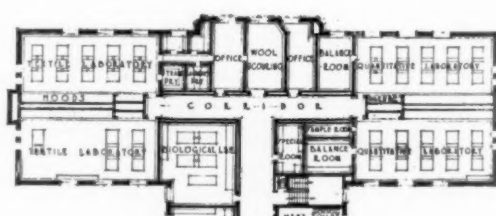
Along with this basic advantage are several others of importance. Corridor space is reduced to a minimum. Instructors' offices are conveniently located adjoining the laboratories, in the stem of the "H." These offices have hoods and tables for private research, and also small blackboards for private instruction. Supply rooms on each floor are served by a central freight elevator.

The First Floor

To remind students that the subject of chemistry is an important one, an attractive and impressive entrance with a two-story rotunda was designed. In the entrance hall exhibition cases are provided where raw chemicals and products illustrating various steps in chemical process are displayed. The rotunda also gives lobby space for the lecture room adjoining, which seats ap-



THE FIRST FLOOR PLAN



THE SECOND FLOOR PLAN

proximately 300 students. The lecture room is finished in cinder block, which has proved an effective acoustical aid.

The offices of the head of the department open off the rotunda, and make use of the space under the upper part of the lecture room. The suite includes a general office and waiting room, a private laboratory, and a small conference room used also for a library for current periodicals and for employment information for senior students.

Other Features of the Building

The building is of modern fireproof construction, of reinforced concrete, with a roof of structural steel, gypsum and slate. The ventilation system consists of two separate sets of electrically driven fans. Air is exhausted through the hoods with vent flues of acid-resisting crock. The laboratory floors of cement are simply finished, and the ceilings, the bottom of the solid slabs between floors, are painted. The plumbing was left as accessible as possible, with numerous clean-outs and connections for continuous flushing. Maintenance costs have been low. Wardrobes in each laboratory, located in a 12-foot space recessed in the wall near the door, have proved very convenient.

The Kedzie Laboratory, including all fees and equipment, cost about $550,000 in 1927. The cubage cost was 42 cents. The building now accommodates 900 freshmen and 500 upperclassmen, and has an ultimate capacity of 1,200 freshmen averaging two hours of lectures and six hours of laboratory work, and 600 upperclassmen averaging two hours of lectures and eight hours of laboratory work per week. A faculty and graduate staff of 40 are also cared for.

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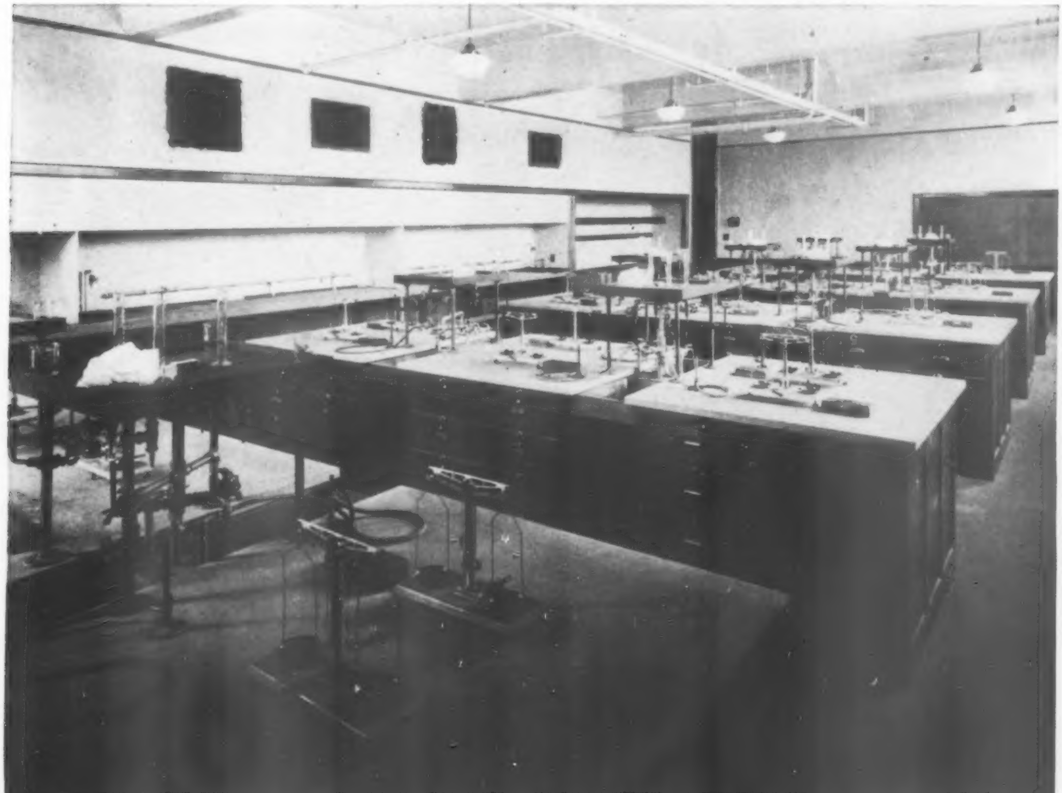

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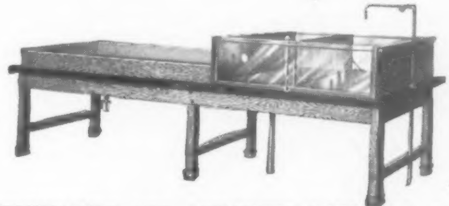
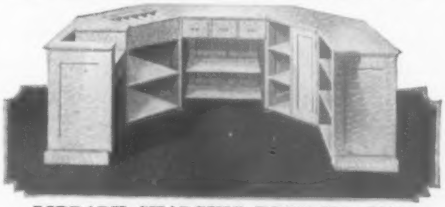


GERMINATING AND AQUARIUM TABLE NO. C-412

DOMESTIC SCIENCE TABLE NO. K-1776



LIBRARY CHARGING DESK NO. 3020

KEWAUNEE LABORATORY IN BUTLER UNIVERSITY, INDIANAPOLIS, IND.

STUDENT'S SEWING TABLE NO. J-1601

MANIFOLD TABLE NO. M-3025

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New York City
804 World Building
Beekman 3–1657

Chicago
230 N. Canal Street
Franklin 4658

KNIGHT-WARE
"IT IS THE BODY ITSELF"
GUARANTEED SATISFACTORY
ACID-PROOF CHEMICAL STONEWARE

Philadelphia
1600 Arch Street
Rittenhouse 6300-6301

St. Louis Office
1st National Life Bldg.
Main 1784

San Francisco
Merchants Exchange Building
Douglas 375

Niagara Falls
309 United Office Building
Niagara Falls 507

Montreal, Que.
1307 Notre Dame Street, West
Main 2625

Products

Acid-Proof Pipe and Fittings for Laboratory Waste, Drain and Ventilating Lines.

Acid-Proof One-piece Laboratory Sinks.

Acid-Proof Ventilating Flue Caps.

Acid-Proof Sumps or Catch Basins.

KNIGHT-WARE is a tough, homogeneous and thoroughly vitrified clay product which is GUARANTEED to withstand the action of acids, alkalies, chemicals and all corrosive solutions, weak or strong, hot or cold. Further we GUARANTEE KNIGHT-WARE to be free from defects and satisfactory in EVERY respect.

KNIGHT-WARE Laboratory Sinks

Our Sinks are made entirely in **one piece** and are entirely **without** seams or joints. All inside surfaces are **smooth** and well **glazed** and corners are all well rounded making them easy to clean and keep clean. Outlets are generally made **integral** with the body of the sink so that the cost of tail-pieces as well as a joint is eliminated.

KNIGHT-WARE Sinks are made entirely by hand and are not **cast** or made in moulds. This enables us to make sinks to your exact order in any dimensions wanted. Sinks can be had with or without backs or drainboards and with a type of outlet best suited for your needs.

FIGURE 237
Acid-Proof Laboratory Sink with Back

KNIGHT-WARE Sinks will not *flake, peel, pit or slough-off*

The tough, dense body of our sinks will never be affected in any way by any acids (hydrofluoric alone excepted), alkalies or corrosives used in the laboratory.

FIGURE 235-N
Acid-Proof Laboratory Desk Sink

KNIGHT-WARE Pipe and Fittings

Available in all bores from 1 inch up to and including 60 inches. We can supply any standard type fitting that can be had in any other material and are often called upon to supply special fittings.

KNIGHT-WARE Pipe and Fittings are easily and economically installed. They are hung much the same as any other pipe, one hanger only being required per fitting or length of pipe. The bells on our pipe are **deep** and well **corrugated** and our method of joint packing assures you of a perfectly acid and leak-proof joint.

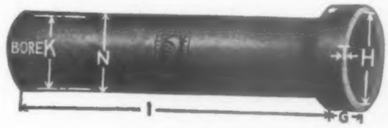


FIGURE 271
Acid-Proof Bell-and-Spigot Pipe

KNIGHT-WARE Ventilating Caps, Sumps, Etc.

These are made entirely to prints and specifications. We are in a position to offer you a variety of designs such as have been supplied for other KNIGHT-WARE installations.

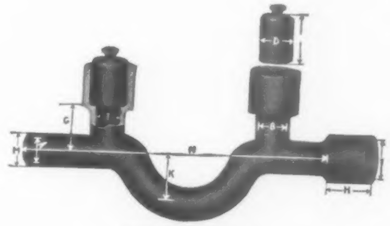


FIGURE 267-A
Acid-Proof Bell-and-Spigot Trap with Cleanout and Vent

Service

We offer you knowledge and practical experience gained through scores of KNIGHT-WARE installations. This service is yours for the asking and without obligation.

A few more notable installations of KNIGHT-WARE Equipment:

PRINCETON UNIVERSITY
Chemistry Building
COLUMBIA UNIVERSITY
Chemistry Building
WEST VIRGINIA UNIVERSITY
Hall of Chemistry
OHIO STATE UNIVERSITY
Chemistry Building
Pharmacy Building
JOHNS HOPKINS UNIVERSITY
Chemistry Building
Hygiene Building
Biology Building
NEW YORK UNIVERSITY
Chemistry Building
WASHINGTON UNIVERSITY
Biology Building
DUKE UNIVERSITY
Chemistry Building
PURDUE UNIVERSITY
Chemistry Building
Pharmacy Building
PENN STATE COLLEGE
Chemistry Building
LAFAYETTE COLLEGE
Mining Engineering Hall
BATTELLE MEMORIAL
Chemistry Laboratory
McGILL UNIVERSITY
Pulp & Paper Research Bldg.
COLUMBIA PRESBYTERIAN
Hospital Centre
UNIVERSITY OF CALIFORNIA
Riverside Chemistry Building
* NEW YORK-CORNELL
HOSPITAL
Medical Centre

* Building now under construction and KNIGHT-WARE being supplied.

View in Chemistry Laboratory—Princeton University. All Waste, Drain and Ventilating Lines, Acid Dilution Basins, etc., at Princeton are of KNIGHT-WARE

GAS ABSORPTION SPREADER

The Matheson Company Absorption Spreader, used in any liquid with any gas, breaks the flow into minute bubbles, thereby insuring rapid absorption. It can be used with any of our special valves or regulators.

Standard sizes are:

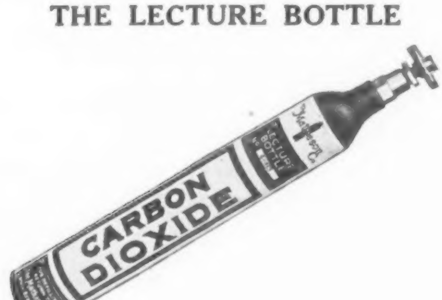
- No. 1—for small test tubes
- No. 2—for large test tubes up to 2 gallons
- No. 3—2 gallons to 6 gallons
- No. 4—6 gallons to 12 gallons

Nos. 1 and 2 are furnished with glass or hard rubber tube; Nos. 3 and 4 with hard rubber tube.

Prices for either standard or special sizes will be quoted on request. Spreaders can be fitted with any kind of tubing. They may be as large as 1 foot long, 1 foot outside dimension, with wall thickness usually 1 mm.

Write Department A for folder describing this Absorption Spreader

THE LECTURE BOTTLE



On account of the convenience of this Lecture Bottle, it has become standard laboratory equipment in many universities, colleges and high schools. It does not need a regulator—its valve being delicate enough to permit close adjustment without one. It is interchangeable in twenty-four gases, and always in stock for shipment on the day your order is received.

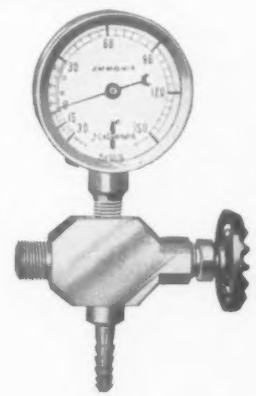
Ask for Bulletin III

LABORATORY AUTOMATIC REDUCING REGULATOR

This Reducing Regulator for Oxygen, Hydrogen, Nitrogen, Carbon Dioxide, Argon, Helium, Nitrous Oxide and other gases will give a close register on low working pressures. It is furnished with needle valve outlet and hose connection, or merely with the low-pressure gauge.

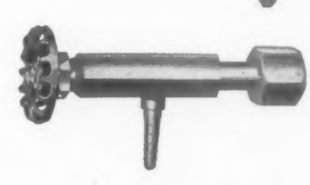
Ask for Bulletin IV

AMMONIA REGULATOR (Non-Automatic)



The Matheson Company Ammonia Regulator permits quick and easy adjustment of flow to less than one bubble per second up to full flow.

Ask for Bulletin IV



NON-AUTOMATIC NEEDLE VALVE

This Needle Valve is furnished for use where a Gasometer is not desirable. It permits quick and easy regulation of all kinds of gases.

RUBBER TUBING

We carry in stock a large supply of Rubber Tubing in six sizes, two weights and three colors. This tubing is specially prepared for use with laboratory gases.

SARTORIUS STUDENT MODEL ANALYTICAL BALANCE

The Sartorius Student Model Analytical Balance is a new design intended for educational laboratories. It is of simple yet correct design which, in combination with workmanship of a degree of precision not usually found in balances of this price, gives an instrument of high sensibility and long life. This balance will stand much abuse and still retain its sensitivity, which recommends it to educational institutions for undergraduate work.

Description

Capacity—200 grms. on each pan.

Sensibility—$\frac{1}{10}$th mg., i. e., a change of weight of 1 mg. deflects the pointer on the scale 2½ divisions with full load or 3 divisions without load.

Beam—Horizontal type of aluminum alloy, 6¼ inches between end knife edges. Graduated into 50 divisions on each side of zero point. Graduations are white on a black background.

Knife Edges and Planes—Finest agate, accurately ground and polished.

Arrestment — The fallaway type with separate pan arrestment. The beam is arrested at four points.

Hangers—Simplified construction, heavily gold plated.

Pans and Bows—Bows of German silver, heavily nickeled, 8¼ inches high and 4¼ inches wide. Pans of highly polished aluminum, 2½ inches in diameter.

Rider Carrier—Sartorius patented type with device which prevents the rider from falling off.

Pointer Scale—White background with 12 black divisions each side of zero.

Case—Highly polished mahogany, 18¾ inches high, 15¾ inches wide and 10¼ inches deep. Base plate of heavy slate, finished with black acid-proof lacquer, equipped with leveling screws.

Price, without weights or riders.. $55.00

Sartorius Student Analytical Weights are adjusted to twice the tolerance of the Bureau of Standards Class S. Gram weights are of two piece brass and lacquered. Fractions above 20 mg. are of German silver and the smaller ones of aluminum, all under glass. Complete with two 10 mg. riders and a pair of ivory tipped forceps, with plush lined mahogany case.

1 mg. to grams	50	100
Price	$8.50	$10.00

NO. 4120

SHELDON DOMESTIC SCIENCE TABLE NO. 4120

This table is the culmination of a development involving years of experience with scores of designs in thousands of schools.

It is unsurpassed in convenience of arrangement, capacity of working surface and storage space; ease in cleaning and keeping clean and finally, strength and durability.

The same qualities of convenience, capacity and sturdiness are applicable to the entire line of more than 35 designs of tables and fixtures for Domestic Science and Domestic Art Departments.

Sheldon Complete Line illustrated in Catalog No. 22. Mailed free on request.

SHELDON DRAWING TABLE NO. 7241

The Sheldon catalog shows over 20 designs of Art and Mechanical Drawing Tables with a range of capacity from one to eight classes. They are built of material 20% heavier than offered by other manufacturers and every principal frame joint is re-enforced with a bolt and nut.

NO. 7241

SHELDON MANUAL TRAINING BENCH NO. 6380

One of the most efficient all around units for the school shop. It is made of heavy selected maple; bolt re-enforced throughout and equipped with a guaranteed Sheldon vise; one of eight designs and sizes.

NO. 6380

The Sheldon Catalog illustrates

35 types of Domestic and Sewing tables
20 " " Art and Mechanical Drawing tables
50 " " Manual Training Benches
27 " " Cases and Cabinets
6 " " Commercial tables
28 " " Auxiliary Furniture

THE U. S. STONEWARE CO.

Works (Since 1865):—Akron, Ohio

New York Office: 50 Church Street

Acid-proof Chemical Stoneware Laboratory Sinks (One-Piece)

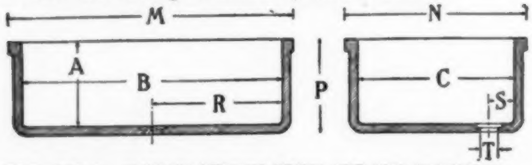


FIG. 112-A—LABORATORY SINK (PLAIN COUNTER-SUNK OUTLET TO TAKE LEAD PLUG)

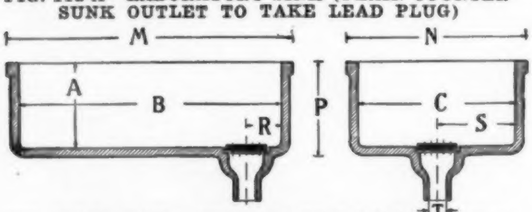


FIG. 112-B—LABORATORY SINK (WITH INTEGRAL NIPPLE AND REMOVABLE STRAINER)

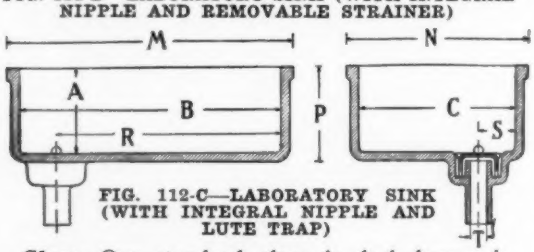


FIG. 112-C—LABORATORY SINK (WITH INTEGRAL NIPPLE AND LUTE TRAP)

Glaze—Our standard glaze is dark brown in color, and is an integral part of the body itself.

Guarantee—"U. S. Standard" acid-proof chemical stoneware is unqualifiedly guaranteed to be acid, alkali and corrosion-proof throughout the entire stoneware body—with or without the salt glaze.

Write for BULLETIN NO. 515 describing our entire Laboratory Line.

Acid-proof Piping for Acid Waste and Ventilating Lines

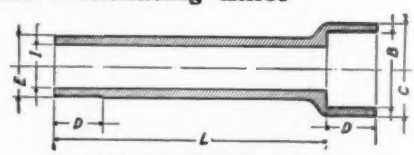


FIG. 149—SOCKET PIPE

Our Acid-proof Chemical Stoneware Piping is the ideal material for Acid Waste and Ventilating Lines. There is no other commercial product which is as universally resistant to acids, alkalies and corrosive chemicals and gases.

Bromine, ferric chloride, sulphuric, sulphurous, nitric and hydrochloric acids of any concentration or temperature, can all be handled with perfect safety. "U. S. STANDARD" Chemical Stoneware Piping is free from all the limitations of brass, rubber, cast iron, lead and high silicon irons. There is no hazard and no upkeep. There are no leaks and no repairs.

An installation of our Chemical Stoneware Piping is very easily and conveniently handled. The first cost is decidedly lower.

Our line is complete, including Elbows, Bends, Y's, TY's, Traps, Crosses, Sumps, Floor Drains, etc.

Other Acid-proof Products for Laboratory Use

- Buechner Funnels
- Distilled Water Tanks
- X-Ray Developing Tanks
- Photographic Developing Tanks
- Stills
- Ball Mills
- Mariotte Bottles
- Evaporating Dishes
- Boiling Kettles
- Acid Pitchers
- Drain Boards
- Laboratory Chlorine Cells
- Electric Mixers
- Slop Jars

LIST PRICES ON ACID-PROOF SINKS (F. O. B. AKRON, OHIO)

Size No.	B	C	A	M	N	P	Code Word	Fig. 112-A		Fig. 112-B		Fig. 112-C	
								Plain Code—ZEST	With Integral Backs	Plain Code—ZONE	With Integral Backs	Plain Code—ZURO	With Integral Backs
700	11	9	8	14	12	9	TAB	$14.00	......	......	......	......	......
701	14	10	6	17	13	7	TACIT ...	14.00	......	......	......	......	......
702	16	8	6	19	11	7	TACK ...	15.00	......	......	......	......	......
703	15	14	6	18	17	7	TAFFY ..	17.00	......	......	......	......	......
704	16	12	6	19	15	7	TAG	17.00	......	......	......	......	......
705	16	16	9	19	19	10	TALE ...	24.50	......	......	......	......	......
706	18	10	11	21	13	12	TALON ..	23.00	$27.00	$28.00	$32.00	$30.00	$34.00
707	18	14	7	21	17	8	TAMP ...	23.00	27.00	28.00	32.00	30.00	34.00
708	18	14	10½	21	17	11½	TANG ...	29.00	33.00	34.00	38.00	36.00	40.00
709	18	16	6	21	19	7	TAPE ...	24.00	28.00	29.00	33.00	31.00	35.00
710	20	12	7	23	15	8	TALLY ..	21.00	25.00	26.00	30.00	28.00	32.00
711	20	12	12	23	15	13	TAR	28.00	32.00	33.75	37.75	35.75	39.75
712	20	16	7	23½	19½	8¼	TAUNT ..	22.00	26.25	27.75	32.00	29.75	34.00
713	24	15	8	27½	18½	9¼	TENOR ..	24.50	28.75	30.25	34.50	32.25	36.50
714	32	16	7	35½	19½	8¼	TERSE ..	32.00	37.00	37.75	42.75	39.75	44.75
715	30	20	8	33½	23½	9¼	THUMB .	38.00	44.00	44.50	50.50	46.50	52.50
716	36	18	7	39½	21½	8½	TIGER ..	41.00	47.00	47.50	53.50	50.50	56.50
717	42	20	12	45½	23½	13¾	TOAST ..	72.00	80.00	80.00	88.00	84.00	92.00

All dimensions in inches. Prices subject to discount. Code Word for Sinks with Integral Back: Add "SPLASH."

Drainboards: Sinks Nos. 707, 712, 713 and 715 are available with integral ceramic drainboards on one or both sides.

Acid-Proof Sinks with Integral Drainboards

These Sinks are made of one piece chemical stoneware, without joints, guaranteed acid, alkali and corrosion-proof **all the way through.** There are no slabs to work loose and become leaky. The corners are rounded. All surfaces are finished with a smooth salt glaze (dark brown color) to insure easy cleaning.

Fig. 533-ASP (with Countersunk Outlet to Take Lead Plug)
Fig. 533-BSP (with Integral Nipple Outlet and Removable Strainer)
Fig. 533-CSP (with Integral Nipple Outlet and Built-in Lute Trap)

Size No.	B	C	A	E	M	N	P	R	Shipping Wt. (lbs.)	Code Word	LIST PRICES F. O. B. FACTORY Fig. 533-ASP	Fig. 533-BSP	Fig. 533-CSP
307	18	14	7	8	37½	16½	8⅞	18	197	Tong	$50.00	$61.00	$66.00
312	20	16	7	10	39¾	19	9⅛	18	285	Tope	52.00	63.00	68.00
313-A	24	18	8	10	43¾	21	10⅛	18	348	Tory	61.00	75.00	79.00
315	30	20	8	10	49¾	23	10⅛	18	410	Tuch	83.00	97.00	101.00

Above list prices are for Sinks with drainboards at right hand or left hand. Special End-Table Sinks can be made up with back cut out for trough drainage. Corner Sinks with double integral backs can also be supplied. List prices subject to discount.

Fig. 536-ASP (with Countersunk Outlet to Take Lead Plug)
Fig. 536-BSP (with Integral Nipple Outlet and Removable Strainer)
Fig. 536-CSP (with Integral Nipple Outlet and Built-in Lute Trap)

Size No.	B	C	A	E	M	N	P	R	Shipping Wt. (lbs.)	Code Word	LIST PRICES F. O. B. FACTORY Fig. 536-ASP	Fig. 536-BSP	Fig. 536-CSP
507	18	14	7	8	54	16½	8⅞	18	284	Trew	$76.00	$91.00	$96.00
512	20	16	7	10	56	19	9⅛	18	402	Trig	78.00	93.00	98.00
513-A	24	18	8	10	60	21	10⅛	18	477	Trow	92.00	108.00	114.00
515	30	20	8	10	66	23	10⅛	18	546	Tude	125.00	141.00	145.00

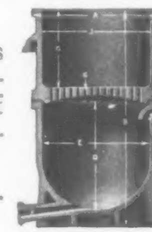
Special End-Table Sinks can be made up with back cut out for trough drainage. Corner Sinks with double integral backs can also be supplied. List prices subject to discount.

H_2S Gas Generators

A time-saver, labor-saver and money-saver for every laboratory. There are no complicated internal parts and no internal gas tubing.

Offered in five standard stock sizes.

Suction Filters



Ten standard stock sizes are available. Recommended for filtration of corrosive acids and chemicals.

Write for Bulletin No. 403.

Developing Tanks

Our line includes Developing Tanks, Trays, Hypo Vats and Solution Jars for handling all sizes of films and plates.

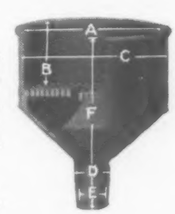
Ask for Bulletin No. 108.

Acid-Proof Pots

For acids, alkalies and corrosive chemicals. Stock items include all sizes of Jars and Pots, with or without outlets, etc.

You should have our Bulletin No. 404.

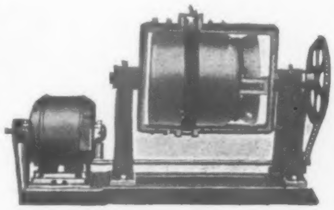
Funnels



We offer the most complete line of Funnels—either in the plain or buechner types—in a total of thirteen standard sizes.

Ask for Bulletin No. 405.

Jar Mills



We have a standard Jar Mill for every grinding or mixing job.

Write for Catalog No. E-4.

ALBERENE STONE COMPANY

Quarriers and Fabricators of Alberene Stone

Main Office: 153 West 23rd Street, New York

Quarries and Mills at Schuyler, Va.

BRANCHES

Boston
Newark, N. J.
Philadelphia
Richmond, Va.
Rochester
Pittsburgh
Cleveland
Chicago
Washington, D. C.

Products (See also page 456)

Alberene Stone, a natural quarried stone, fabricated for the following purposes in school construction:

Stair Treads and Landings	Toilet Partitions
Door and Window Sills	Urinals
Plinths, Trim, Wainscot	Shower Compartments
Spandrels	Shower Dressing Rooms
	Flooring and Base

Physical Characteristics

Alberene is a natural quarried stone, blue-gray in color, non-stratified and free from cleavage lines, dense, uniform in texture and color, practically non-absorbent and non-staining, easily cleaned, flame resistant and fireproof. It is easily machined —tongued, grooved, slotted, bored or turned —without splitting or spalling.

Sanitary Work

The outstanding superiorities of Alberene for toilets, urinals and showers are: (a), its non-absorbent, non-staining, easily cleanable qualities; (b), its easy fabrication by means of tongue-and-groove, bolted-and-cemented joints, in structures that are impervious and 100% sanitary; (c), its non-spalling, non-chipping surface.

Stair Treads and Landings

A special grade of hard Alberene selected for these purposes has a "toothed" surface which never wears away and which is always non-slipping under all conditions. Its wearing qualities also are excellent, and it is absolutely fireproof.

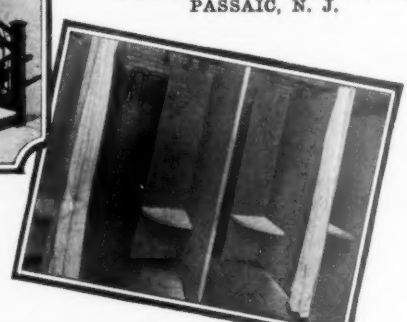
The Matter of "Life"

The limit of useful "life" of Alberene Stone has not yet been revealed in an experience of over 40 years. Barring accident, the moderate first cost of Alberene Stone equipment is the one and only cost— there are no after-costs.

TOILETS AND URINALS
HIGH SCHOOL, MONTCLAIR, N. J.

STAIR TREADS AND LANDINGS
HIGH SCHOOL, SOMERVILLE, N. J.

SHOWERS AND DRESSING ROOMS
MEMORIAL SCHOOL NO. 11, PASSAIC, N. J.



THREE TYPICAL EXAMPLES OF THE USE OF ALBERENE STONE IN SCHOOL EQUIPMENT

THE AMERSIL COMPANY, INC.

Manufacturers of

American Fused Silica Products

TRADE **AMERSIL** MARK

88 Cypress Avenue, NEW YORK, N. Y.

"Amersil" contains 99.8% $SI.O_2$ and has remarkable properties of great value for scientific and technical purposes.

In many laboratory operations "Amersil" has replaced platinum and other costly materials.

The properties of "Amersil" are:

RESISTANCE TO CORROSION

Acids in general have no effect whatever on Amersil. An exception is hydrofluoric acid, and at high temperature phosphoric acid has a slight action.

RESISTANCE TO HIGH TEMPERATURE

Amersil will permanently withstand temperatures up to 1150° C. or 2102° F. and for short periods up to 1550° C. or 2822° F.

RESISTANCE TO THERMAL CHANGES

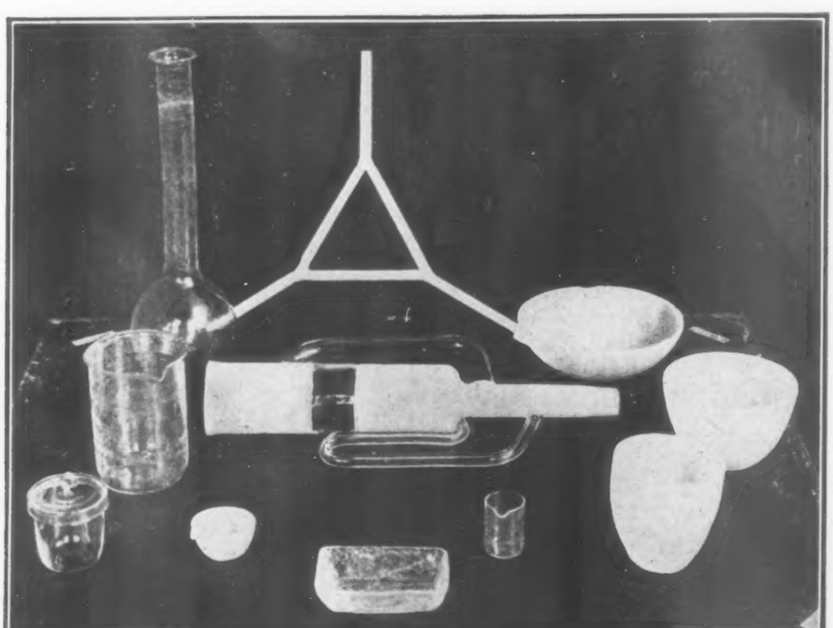
Amersil can be heated white hot and thrown into cold water without damage, owing to its very low coefficient of expansion which is 0.00000054 per degree centigrade.

RESISTANCE TO ELECTRICITY

Amersil has a higher dielectric value than porcelain, glass or other insulating materials. It also retains this superiority at high temperatures over any known insulator.

"Amersil" is an **American product** of the highest quality and should be used wherever fused silica or quartz is required.

"Amersil" products are obtained through all dealers or direct from our factory.



BAKER & CO., INC.

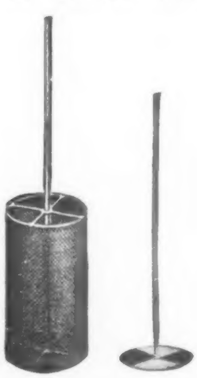
R & H PLATINUM WORKS, INC.

54 Austin Street, Newark, N. J.

30 Church St. NEW YORK — 760 Market St. SAN FRANCISCO — 55 East Washington St. CHICAGO

PLATINUM WARE FOR ALL LABORATORY AND INDUSTRIAL PURPOSES

We specialize in laboratory ware made from platinum-rhodium. As compared with pure platinum, platinum-rhodium has many very distinct advantages. The alloy is stiffer than platinum and vessels made of it keep their shapes better. It becomes less soft on heating and does not tear so easily. On ignition, its weight constancy is better. It is harder and so suffers less loss from sand cleaning. Fusion and acid losses are smaller and fusions do not distort crucibles made of it. The melting point is slightly higher. Crystal development is slower and the crystals are smaller. The rate of vaporization is less.



The Baker line includes everything the well equipped laboratory needs in platinum ware, made either of the pure metal or of the platinum-rhodium just described. Another specialty is platinum gauze for ammonia oxidation in the manufacture of nitric and sulphuric acids. Platinum, both pure and alloyed, is available in all forms as well as platinum black, sponge, salts and solutions.

Baker & Co., Inc., are headquarters for wires for thermocouples, bare drawn wires of ductile materials down to 0.0008″ and others, from very ductile metals, as small as 0.0005″. There is a long series of Wollaston wires and wires made by the Taylor Process from such elements as antimony, bismuth, cadmium, cobalt, gallium, lead, selenium, etc.

Prices are the lowest possible to quote for products of the highest quality. The Baker guarantee stands behind everything produced.

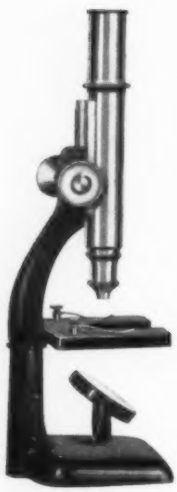
BAUSCH & LOMB OPTICAL CO.

674 St. Paul St., Rochester, N. Y.

New York Chicago Boston Los Angeles San Francisco
London, England Frankfurt a/M, Germany

MICROSCOPE AA

For Student Use



MICROSCOPE AA

Standard — (eyepiece, society screw thread on objectives, body tube length). Same quality as larger instruments. Sturdy, and simple of manipulation.

Base — detachable allowing examination of either transparent or opaque objects. Mirror removable from base and can be placed in hole in arm for indirect lighting of opaque specimens.

Eyepiece—Huygenian 5 X (10 X optional at extra cost).

Objective—7.5 X or 15 X (divisible).

Magnification—37 X or 75 X (75 X and 150 X with 10 X eyepiece).

Finish—Chromium and black.

THE WIDE-FIELD TUBE

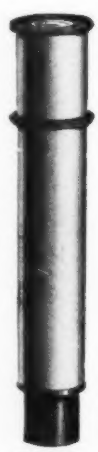
Increases Microscope Usefulness

The new Bausch & Lomb Wide-Field Attachment is an extremely valuable adjunct to the microscope equipment, especially in the biological laboratories of educational institutions. It is characterized by the following advantages:

Extremely Large Field—The great field of view makes the instrument adaptable to many uses heretofore impossible except with the wide-field microscope.

High Eyepoint Position—This feature enables even the wearer of glasses to observe the entire field without discomfort.

Long Working Distance—These Tubes combine a field of view as large or larger than can be obtained with a hand magnifier of the same power and a working distance several times as large as is afforded by the latter.



WIDE-FIELD TUBE

The attachment forms an inverted and reversed image. It is completely self-contained, and can be used by slipping it into the regular eyepiece adapter in any monocular microscope and removing the objective. It is also available mounted on a tripod stand, making it, in itself, a complete monocular wide-field microscope.

Bausch & Lomb Optical Company manufactures Microscopes and accessories, Microtomes, Colorimeters, Refractometers, Spectrometers, Micro-projection Equipment, Photomicrographic Apparatus, Projection Instruments, Photographic Lenses, Binoculars, etc. Also manufacturers of Orthogon Eyeglass Lenses for Better Vision.

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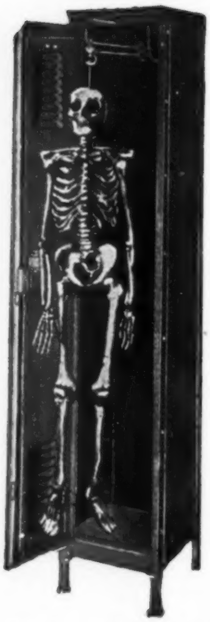
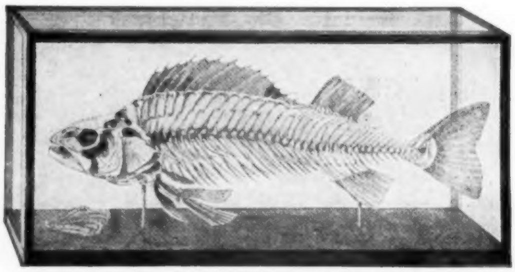


Human Skeleton in Steel Cabinet Specially Constructed



Fish Skeleton in Case

Life History of Chick

Catalogs will be sent on request.

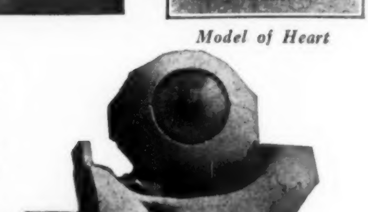
Mention which of following you desire: Anatomical and physiological models, specimens, charts, botanical models, human and animal skeletons, zoological models, specimens and preparations, Riker mounts, insect pins.

"PROMI" MICROSCOPIC DRAWING AND PROJECTION APPARATUS

Model of Heart

Spalteholz Transparent Preparation of Human Embryo

The "Promi" is an ingenious yet simple and inexpensive apparatus recently perfected by a prominent German microscope maker, that projects microscopic slides and specimens on table or wall for classroom or group demonstration. Can also be used as a compound microscope and for microphotography. Complete in case **$100.00.** Prospectus gladly sent on request.



Model of Eye

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Chemical Sales Department

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MORE THAN 2700 SYNTHETIC ORGANIC CHEMICALS FOR CLASSROOM AND LABORATORY

The Synthetic Organic Chemical Department of the Kodak Research Laboratories is the American headquarters for organic chemicals for laboratory uses.


ENTRANCE TO KODAK PARK

The manufacture of these products, begun as a patriotic duty in 1918 when long patronized sources of supply were cut off, has been continued because of steady demand. This department is operated as a service to research workers, making the routine preparation of many organic chemicals required for research unnecessary in college and industrial laboratories.

There are over 2700 Eastman Synthetic Organic Chemicals in stock, ready to be shipped to fill needs in teaching, research, or testing work. They make it unnecessary for graduate students to prepare all of the substances used in their research problems. Thus, more time can be productively spent in advancing into unexplored fields. And in analytical laboratories, so valuable have the tests for metals with organic reagents become that they are replacing many of the older methods. Indicators, stains, biochemical reagents, amino acids, rare sugars, are among those listed.

List No. 22 of Eastman Organic Chemicals, published January, 1931, may rightfully be termed, "A handbook of America's organic chemicals." It gives specific purity data, for each compound, which may be regarded as criteria below which the substance supplied will not fall. Package sizes and prices are also given. It is an ideal pocket reference.

Purchasing agents when requesting quotations should specify purity of organic substances in terms of boiling range, melting point, or similar definite criteria of purity, as the term "C. P." has little meaning when applied to such substances. The Eastman List of Synthetic Organic Chemicals is a valuable aid in making out such specifications.

Eastman Organic Chemicals may be purchased directly from Eastman Kodak Company, ***Chemical Sales Department,*** Rochester, N. Y., or from many of the larger scientific chemical supply houses which carry stocks and will fill orders.

List No. 22 of Eastman Organic Chemicals will be sent free on request

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Manufacturers of

High Grade Acid-Proof Chemical Stoneware

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San Francisco, Calif., 276 Monadnock Bldg.

Montreal, Que., 1111 Beaver Hall Hill
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Being the largest concern in the United States manufacturing Acid-Proof Chemical Stoneware, we have unsurpassed facilities for the manufacture of a complete line. This, together with 24 years of practical experience in this line, insures the highest standard of work, prompt shipment and reasonable prices.

Advantages

Here are some of the advantages of General Ceramics Chemical Stoneware:

It is vitrified thoroughly **all the way through.** Does not depend on an applied glaze or veneer for its acid-resisting properties.

Guaranteed to be tight, non-porous and impenetrable by acids, alkalies and other strongly corrosive substances. No loss through leaks. No contamination of products. No hazard to employes or property.

Scientifically shaped and proportioned safely to withstand mechanical shock. Lasts indefinitely. Requires no upkeep or repairs.

Our large stock enables us to make immediate shipment of standard shapes and designs. Special designs can be also furnished promptly.

Guarantee

We will not knowingly permit a customer to remain dissatisfied with any transaction.

Services

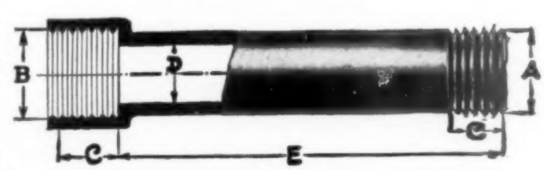
Our Engineering Department is maintained to assist in the selection of the proper and most economical stoneware equipment for any requirement and in designing stoneware plants and apparatus to meet specific requirements, without imposing any obligation upon the engineer, architect or owner.

We are prepared to contract for the erection of complete installations for the handling and storage of acids or other corrosive liquids; to furnish advice on the installation of stoneware apparatus, or to provide experienced men for the erection.

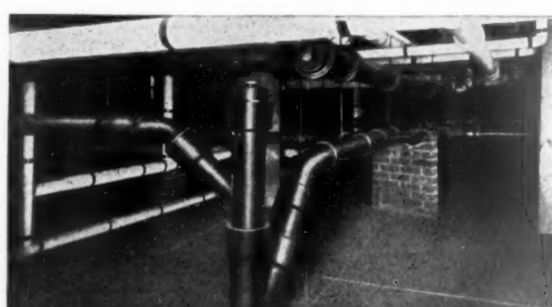
Literature

Write for our Catalog showing complete line, dimensions, etc., also price list.

LABORATORY SINK



SOCKET PIPE



GENERAL CERAMICS ACID-PROOF CHEMICAL STONEWARE IN STERLING CHEMISTRY LABORATORY, YALE UNIVERSITY, NEW HAVEN, CONN.

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

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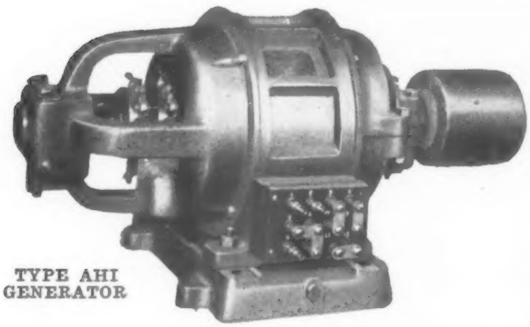

TYPE AHI GENERATOR

Educational Laboratory Equipment

While the usual commercial sizes of electric apparatus are available at educational prices, it is recognized that for the laboratory work of our schools and colleges the size, cost and power required for the operation, of much commercial apparatus prohibits its use.

At the same time, it is desirable that the operating characteristics and physical appearance of laboratory machines conform as nearly as possible to those of the larger units.

For this reason, the General Electric Company has given special attention to the design and manufacture of a number of different laboratory machines and devices that embody the characteristics of the corresponding commercial types.

G.E. Dynamometers

G.E. DYNAMOMETER

G.E. Dynamometers are considered standard equipment in research laboratories for accurate measurement of power or torque. Many technical schools also have dynamometer laboratories to give students the opportunity of becoming acquainted with their operation and the methods used throughout the automotive industry.

Dynamometers are used also for many other applications where accurate horsepower or torque measurement is required, such as the testing of pumps, turbines, fans, gears, tires, automobile chassis, etc.

The G.E. Dynamometer cna be operated either as motor or generator with equal facility and accuracy.

Electric Measuring Instruments

PORTABLE OSCILLOGRAPH WITH FILM HOLDER IN PLACE

No apparatus in the college laboratory is of more importance than the electric measuring instruments. A well-equipped laboratory will need an assortment of standard instruments of all types and capacities, since there is hardly an experiment performed by the students which does not require their use.

TYPE P-3 ALTERNATING CURRENT WATTMETER

When selecting laboratory instruments, too much care cannot be given to accuracy, permanence of calibration, dead-beat indications, and legibility of scales. Of course local disturbances should not influence readings, and in many cases low internal losses are important. In the design and construction of G.E. electric measuring instruments, careful consideration is given to all these details.

Write for the complete booklet, "Electrical Laboratory Apparatus," and "Laboratory and Shop Equipment for Electrical Departments of Technical Schools and Junior Colleges."

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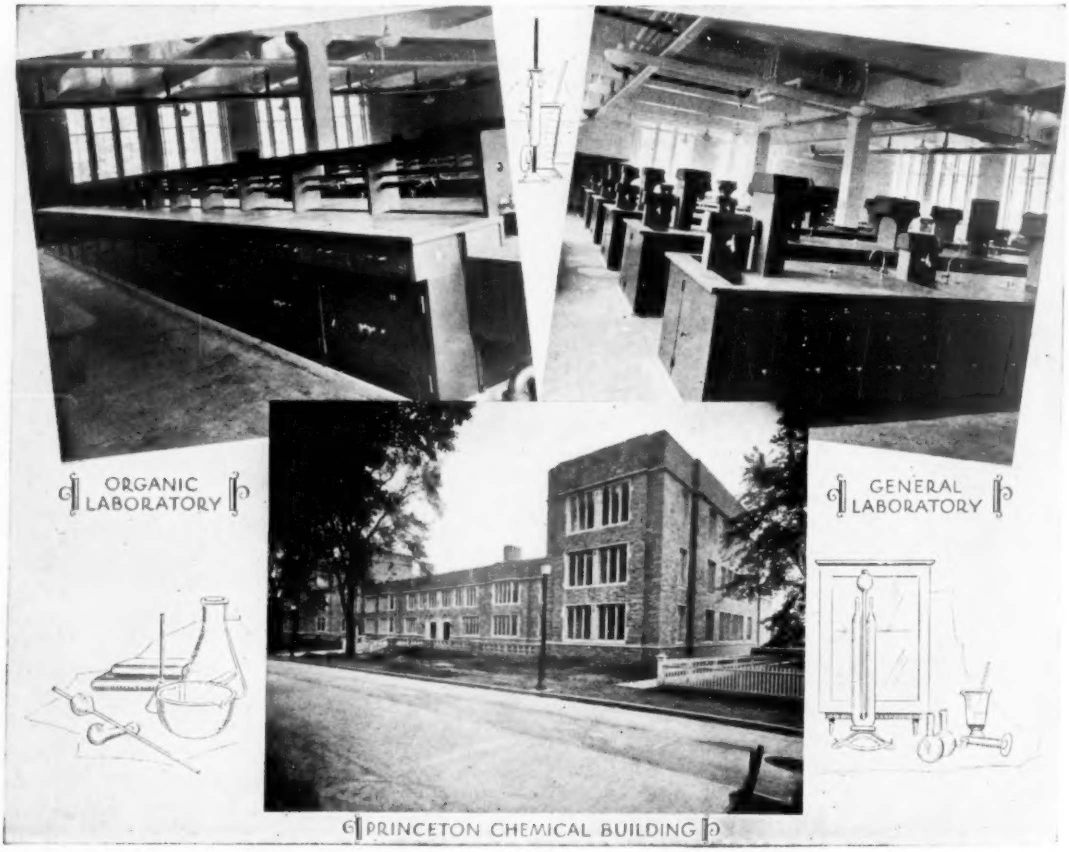
Laboratory Desks and Tables of GF Allsteel possess many advantages not common to other types of tables. Doors and drawers never warp, swell or split. Handles never pull off. Drawers never stick to cause broken glassware.

Built on the unit principle to facilitate installation and repairs to plumbing. Of non-combustible construction, they reduce the fire hazards of laboratories. Continuous tops of Alberene stone are proof against acids.

Below are illustrations of this equipment in new Frick Chemical Laboratory, Princeton University.



Charles Z. Klauder, Architect

HOYT ELECTRICAL INSTRUMENT WORKS

755 Boylston Street — Boston, Mass.

For more than twenty-five years Hoyt has been building meters for every industry and for laboratory and schoolroom use. Hoyt instruments are well and favorably known for their dependability and ruggedness of construction which assures their long life in the hands of students.

PORTABLE VOLT-METERS AND AMMETERS

NO. 515 FOR DIRECT CURRENT
NO. 517 FOR ALTERNATING CURRENT

D. C. VOLTMETER—515

Hoyt portable voltmeters and ammeters are mounted on **Bakelite** bases 5" x 4". The movements for direct current are of the D'Arsonval type equipped with drop forged magnets carefully hardened and drawn to insure permanence. All pivots turn in sapphire bearings. The scales are hand calibrated and equipped with mirrors to avoid paralax in reading. The alternating current meters are built on the repulsion or soft-iron principle. Damping is secured by a vane attached to the movement moving in a partially closed air chamber. Accuracy—1%.

PRICES:

Type	515 D. C.	517 A. C.
Voltmeters		
0-90 millivolts	$15.00	
0-3 volts	15.00	
0-10 volts	15.00	$18.00
0-30 volts	15.00	18.00
0-50 volts	17.00	18.00
0-125 volts	18.00	19.50
0-150 volts	18.00	19.50
0-300 volts	21.00	25.00
0-600 volts	25.00	27.50
Ammeters		
0-100 milliamperes	15.00	
0-1 amperes	15.00	18.00
0-10 amperes	15.00	18.00
0-25 amperes	17.00	18.00
0-50 amperes	20.00	20.00

Double-Scale D. C. Voltmeters and Ammeters, Type 515, can be supplied. Price, $21.75.

TYPE P-5 D. C. and P-5 A. C.

This is a more accurate instrument but resembles in general appearance the 515 and 517 meters. It is mounted on a larger base to make room for the unusually large drop forged magnet and 4-inch scale. The movement is exceptionally "dead beat" and the 4-inch scale is equipped with a mirror over which travels a knife-edged pointer making possible extremely close reading. The sensitivity of the D. C. movement is 200 ohms per volt, the accuracy is within one-half of one per cent.

Prices, $25.00 to $35.00, depending on range.

PORTABLE VOLT AMMETERS FOR DIRECT CURRENT

ROTARY TYPE

Voltammeters of the Hoyt Rotary type have become popular in automobile service work, in radio, in railroad-signal and fire-alarm maintenance, and in fact, everywhere there is a demand for a compact rugged combination instrument of small size with a number of ranges. The design is exclusively Hoyt; and as nearly "accident proof" as it is possible to make a measuring instrument. The meter movement is in a nickeled case mounted on a suitable block, containing a Rotary switch, so arranged that as the meter itself is turned, the proper connection is made for reading its various scales. The meter has a D'Arsonval movement, sensitivity of 70 ohms per volt; with jeweled bearings; scale length: 1¾", accuracy: 1%.

Price: 0/3/30 amps., 0/3/30 volts, $17.50

Other combinations of ranges can be supplied.

HANDY METERS

TYPES 562 D. C.— 562 A. C.

Type 562 represents an excellent meter for individual student use in either D.C. or A.C. at a very reasonable price.

The instrument can be furnished as a voltmeter or as an ammeter in single or double ranges to meet individual school requirements. Accuracy — 2%. Bakelite case.

Direct Current		Alternating Current	
Type 562 D. C.	**Price**	**Type 562 A. C.**	**Price**
Voltmeter		**Voltmeter**	
0-3	$9.00	0-15	$9.00
0-15	9.00	0-30	9.00
0-30	9.00	0-150	9.00
0-150	9.00	0-300	10.00
Ammeter		**Ammeter**	
0-5	$9.00	0-1	$9.00
0-10	9.00	0-5	9.00
0-15	9.00	0-15	9.00
0-30	9.00	0-20	9.00

DOUBLE AND TRIPLE-SCALE VOLTMETERS

Direct Current		Alternating Current	
Type 562 D. C.	**Price**	**Type 562 A. C.**	**Price**
0/3/30	$9.50	0/4/16/160	$14.00
0/12/120	10.00	0/150/300	13.50
0/7.5/150	10.00		
0/10/200	10.00		

LABORATORY CONSTRUCTION COMPANY

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"Better Laboratory Equipment" for Schools

"Better Laboratory Equipment" has been designed primarily for efficient operation, cleanliness and durability. We shall be glad to send any school executive our catalog in which is described Kjeldahl Digestion and Distillation Apparatus, Laboratory Equipment Tables and Carts, Acid Dispensing Stands and Electric Heating Units.

The KJELDAHL Digestion Unit

Internal Self-Draining Fume Tube with Air Ejector (patented)

Does Not Require a Hood

The fume tube on this unit features the internal drain sockets which confine the acid condensation inside the tube. Proper drains are provided to care for the condensation from the fume tube, ejector and stack. This eliminates the drip on table tops and floor or the need of placing an open drain under the battery of sockets. Cleanliness is thereby assured, and internal drainage is obtained throughout the fume tube and stack.

The fume tube, air ejector and fan elbow are made of heavy chemical lead properly reinforced and designed. It is one piece, no flanges for condensation to creep through. The suction arrangement is such that no acid comes in contact with the blower, eliminating upkeep and dirtiness caused by sulphate. Full details in catalog.

The KJELDAHL Distillation Unit

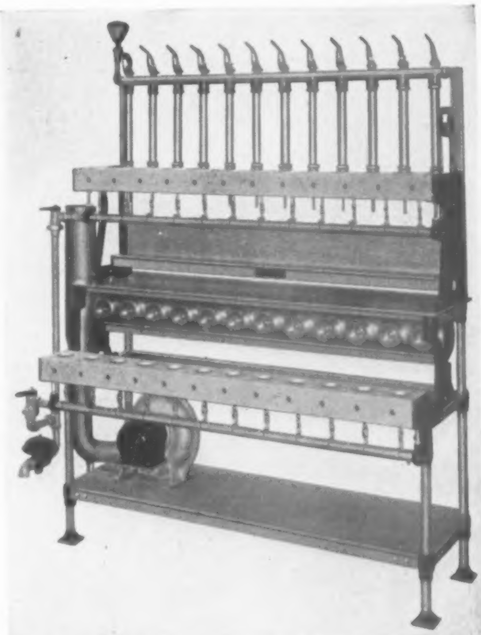
All-Brass Thermo-Siphon Pressure Condensers with Thermometer and Hand Valve Control

The condensers of the Kjeldahl Distillation Unit feature the manifold and water jacket tubes. The tube farthest away from the fresh water intake operates the same as the one closest to it. The flow of water can be regulated to maintain cold water in contact with the receiving tubes. Each single condenser is operated in a battery of twelve at the same temperature. A thermometer and control valve for water supply permits each battery of twelve condensers to be maintained at a temperature that has been predetermined for the highest efficiency.

Our construction eliminates many connections and permits a uniform area of water circulation. Air pockets and stagnation in circulation are practically impossible. Constant circulation is provided at all times by forced circulation operating under the thermo-siphon principle with controlled back pressure. With this system maximum condensation is obtained with minimum water pressure. Full details in catalog.

Laboratory Equipment Tables

Equipment and Work Tables are constructed with a thought for convenience; designed with the necessary shelves and brackets to facilitate work; durable and serviceable; any required size.



A COMPACT COMBINATION KJELDAHL NITROGEN UNIT WITH DISTILLATION DECKED OVER DIGESTION

12-flask capacity, gas equipped. Over-all dimensions 2'0" x 5' 7⅜". Height from floor to top of digestion runway 30 inches. Height from floor to top of distillation runway 58 inches.

Balloon Flask Heater—Portable

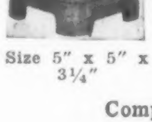
For 2, 3 or 5 Liter Flask

A heavy-duty, high-watt electric heater. Dimensions 10¾" x 10¾" x 6¼"

Rheostat

Individual Portable Rheostat. Dimensions 5" x 5" x 5"

Goldfisch Electric Heater



Size 5" x 5" x 3¼"

A durable heater of high efficiency with special features for operation intended. Each heater is tested for wattage, making it possible to now purchase heaters in batteries with only a variation in wattage of 2 per cent on constant voltage.

Complete Details on Request

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Building equipment of this kind has been our sole business for more than 39 years.

We are pioneers in the industry. Our equipment is all for this kind of furniture. This specialization has made experts of our men. Each job with its little individual problem to solve makes it just that much easier for us to solve the problems on the next job. Thus our organization has become masters in the art.

Peterson furniture is built with the latest features and the price is within reach of those who demand furniture of lasting quality.

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RAWSON ELECTRICAL INSTRUMENT CO.

INCORPORATED 1918

Cambridge, Mass.

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Daily News Building
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RAWSON METERS are designed and built by reliable instrument makers of long experience and are fully guaranteed. They have been adopted as standard in most of the largest and best-known laboratories. Our patented double-pivoted movement is standard, single-pivoted movement supplied to order only.

RAWSON MULTIMETERS are economical, 14 meters in one. Simple to use, just three binding posts and one selector switch.

Types 501A, 501B and 501C for D.C. cover currents from one microampere to one ampere, and voltages from 20 microvolts to 1000 volts.

Also supplied with 100-ampere shunt if desired; fits inside cover.

Type 507A Junior Multimeter, similar ranges to above, but smaller, much less in price.

Types 502A and 502B for A.C. or D.C., Thermal, independent of frequency up to 5000 cycles. Will withstand 100 per cent overload, covering ranges from 2 milliamperes to 5 amperes and 60 millivolts to 1500 volts.

Prices ranging from $80.00 to $150.00.

Microammeters and Milliammeters — single, two, three, four, five and six ranges, reading from full scale for 3 microamperes up.

Similar ranges in millivolts and volts from full scale for one millivolt up.

Prices ranging from $45.00 to $107.50.

Similar ranges in Thermal meters for A.C. or D.C. milliammeters and voltmeters.

Prices from $59.50 up.

For ultimate sensitivity in portable meters see our type 503 Semisuspended Microammeters and Millivoltmeters, measuring currents from .5 microampere up and voltages from .12 millivolt up. Also supplied in multiranges.

Prices from $125.00 up.

For measuring magnetic Flux with a strictly portable meter use our type 504 Fluxmeter, 10,000 Lines or Maxwells per division per one turn of search coil, with electrical zero return.

Price $125.00.

Wattmeters, type 520, suitable for use on very low power factors around .01. Ranges from .01 Watt full scale, up. Supplied in single or multiple ranges. Inquiries should state maximum and minimum currents, voltage and power factor likely to be encountered. Fitted with air damping to facilitate quick reading.

Prices from $110.00 for single range to $150.00 for six range with switch to change from series to parallel on current side and selector switch to change resistances of ranges on pressure side.

Dynamometer Milliammeters and Voltmeters, type 520, measuring full scale ranges from 10 milliamperes and .5 volt.

Prices from $110.00 up.

Electrostatic Voltmeters, type 508, no power consumption on D.C. and very little on A.C. Full scale ranges from 120 volts up to 3000 volts. Internal capacities from 110 micro-micro-farads down. Supplied in single, double and triple ranges. Higher voltages on A.C. can be obtained by special multipliers.

Prices from $120.00 up.

Thermo couples, mounted or unmounted, type 515, for use on any frequency including radio frequency, rating from 1 milliampere up.

Price mounted in bakelite case $14.50; UX mounted $13.50, unmounted $11.50.

Resistance Meters, with self-contained battery and adjustment for battery ageing, measuring from low coil resistances up to insulation in megohms.

Prices on application.

We are well equipped to handle special work to customer's specifications. We shall gladly quote upon your requirements.

SPENCER LENS COMPANY

Manufacturers of
MICROSCOPES—MICROTOMES—DELINEASCOPES
Buffalo, New York

BRANCHES
New York Chicago Boston San Francisco Washington Minneapolis Los Angeles

SPENCER MICROSCOPES FOR HIGH SCHOOL AND COLLEGE USE

The Spencer Lens Company have been pioneers in microscope-building, the first Spencer microscopes being made more than 75 years ago. They were the first to build apochromatic objectives; the first, and for a dozen years the only, manufacturer in America to build microscopes with side fine-adjustments; the originators of the attachable mechanical stage that clamps on the side of a microscope; the originators and only builders of fork-type substages, converging tube binocular microscopes, combination binocular and monocular body all in one, combination substage condenser and dark-field illuminator. In short, most of the improvements in microscope construction during recent years have originated in our factory.

Most laboratory workers prefer Spencer microscopes not merely because the Spencer Company were pioneers, but because they have continued to pioneer all down through the years up to the present day.

SPENCER NOS. 55 AND 56

SPENCER NOS. 55 AND 56

These exceptionally large instruments meet in a most satisfactory way the demand for a large stage. The plate glass stage is 100 mm. x 100 mm. Objects in the center of a dish 50 mm. high and 130 mm. in diameter may be brought into the lines of vision. (Illustrated above.)

SPENCER NO. 34-MH

SPENCER NO. 34-MH

This laboratory microscope embodies all features essential for good practical diagnosis. The mechanical stage is permanently attached, having a range of motion sufficient to cover the 3″ x 2″ microscope slides. Objectives and objective buttons are chromium plated for durability and, with the black enamel finish of the microscope itself, add to the general beauty of the instrument. It is the perfect microscope for the medical student's use.

SPENCER NO. 64

Microscope No. 64 with side-fine adjustment, lever type, is an ideal instrument for high school or college use where simplicity and durability are paramount considerations. It is easy to use, rugged in design, and has a superior type of fine adjustment, with 34 threads of the screw engaged instead of the usual one or two.

SPENCER NO. 64

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Springfield, Mass.

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The Standard Electric Time Co. of California
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SPOKANE, 110 S. Cedar St.

The Standard Electric Time Company of Can., Ltd.
726 St. Felix Street, Montreal

STANDARD LABORATORY EQUIPMENT
(Approved by Underwriters)

General

This equipment consists of current distribution and control panel, motor generator and storage battery. The apparatus is used in physics, chemistry, biology and electrical laboratories, and any other places where electricity is desired for experimental purposes.

Panel

The experimental board consists of a jack panel and a control panel. The jack panel is furnished with a double pole receptacle for the termination of each table circuit, also current supply jacks for low and high voltages D.C. and A.C. The arrangement is such that all table circuits may be furnished with the same or different voltages simultaneously. This is accomplished by plugging flexible connectors from current supply jacks into the table circuit jacks.

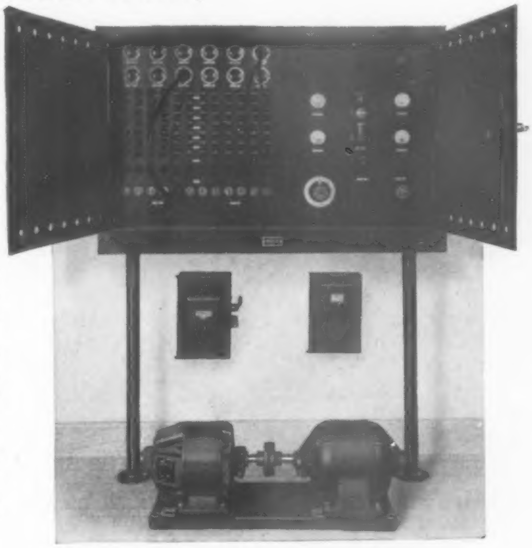
The control panel contains all necessary voltmeters, ammeters, switches, transformer, rheostats, etc., for the control of the motor generator and charging of storage battery. The cut shows a 12-table circuit panel.

Motor Generator

The motor generator is furnished usually to supply from 80 to 115 v. D.C. where this is not otherwise available in the building. The size and type of machine depends entirely upon needs of the institution.

Storage Battery

Storage batteries of various capacities and number of cells are furnished to give the range of low D.C. voltages. Taps are taken off the battery at various points and connected to the battery jacks on panel.



Flexibility

This equipment has a great flexibility of use in that various groups of students may work on different experiments requiring different voltages at the same time. The apparatus appeals to all people who teach electricity. Panels are designed and built to meet the particular requirements of the school in which they are installed as well as to conform fully to underwriters' requirements.

We are always glad to make suggestive layouts and submit prices covering special needs.

Ask for literature or our representative to call.

See pages 126 and 127 for electric clock and fire alarm systems.

WESTON ELECTRICAL INSTRUMENT CORP.

601 Frelinghuysen Avenue, Newark, N. J.

ENGINEERING AND SALES OFFICES

Albany	Cleveland	Knoxville	Philadelphia	San Antonio
Atlanta	Dallas	Los Angeles	Pittsburgh	San Francisco
Boston	Denver	Minneapolis	Portland	Seattle
Buffalo	Detroit	New Orleans	Rochester	Spokane
Chicago	Jacksonville	New York	St. Louis	Syracuse
Cincinnati				Tacoma

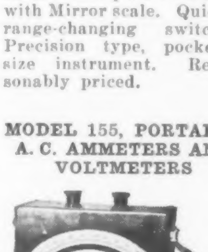
The World's Scientific Standards

Wherever electrical tests are made, there is no single measurement which does not derive its authenticity from an original Weston discovery or invention. The use of Weston instruments in schools and scientific laboratories has become as thoroughly established as the art of measurement itself. It is a fixed principle that only "Westons" should be used in the study of electricity, just as Ohm's Law is a fundamental part of the student's educational groundwork. Only the most exacting standards of craftsmanship and accuracy should be offered the student as examples of the precise work which makes for progress and success in the professional and scientific field. And that means "Westons"—the electrical measurement standards of the world. Following are a few of the many hundreds of models shown in the Weston catalog—these being particularly recommended for school equipment.

MODEL 540, PORTABLE D. C. VOLT-AMMETERS (Fuse-Protected)

Made with six ranges. Independent replaceable fuses protect each of the three current and three potential ranges. Solid, compact Bakelite case. Instrument provided with Mirror scale. Quick range-changing switch. Precision type, pocket-size instrument. Reasonably priced.

MODEL 155, PORTABLE A. C. AMMETERS AND VOLTMETERS



For general alternating current testing. Movable iron type. Accuracy, within ½ of one per cent. For use on commercial frequencies. Can also be used for direct current testing.

MODEL 45, PORTABLE D. C. AMMETERS AND VOLTMETERS

Permanent magnet movable coil type instruments for general testing. Shielded from the effects of external magnetic fields. Accuracy, within ½ of one per cent.

MINIATURE PORTABLE A. C. TEST SETS

Handy, compact, light-weight instruments enclosed in durable bakelite cases, furnished with leather carrying case. Model 539 Current Transformer; Model 528 One-Ampere Ammeter; Model 528 Voltmeter. Testing range from 0.2 to 200 amperes. Voltmeters can be supplied in various combinations of voltages. All instruments can be ordered singly, if preferred.

OTHER WESTON PRODUCTS

The Weston line covers every field of electrical testing. Write for your copy of the 1931 Catalog containing descriptive information and prices with reference to hundreds of models and many thousand range combinations.

MODEL 565 COMPLETE RADIO TEST SET

Practically a portable radio laboratory—contains set tester, tube checker and R. F. Oscillator. Makes all required tests on A. C. and D. C. sets. Invaluable aid in locating and correcting set and tube troubles. Easy to operate. Complete with instruction book. Ideal for student use.

Section XI

COLLEGE, UNIVERSITY AND NORMAL SCHOOL PRESIDENTS

(*Normal school principals are designated by an asterisk*)

City	*Institution*	*President*
Alabama		
Athens	Athens College for Young Women	E. R. Naylor
Auburn	Alabama Polytechnic Institute	Bradford Knapp
Birmingham	Birmingham-Southern College	Guy E. Snavely
Birmingham	Howard College	T. R. Eagles, Acting
Daphne	State Normal School	D. R. Murphey
Florence	State Teachers School	H. J. Willingham
Jacksonville	State Teachers School	C. W. Daugette
Livingston	State Teachers College	G. W. Brock
Marion	Judson College	Harry H. Clark
Montevallo	Alabama College	O. C. Carmichael
Montgomery	State Teachers College	H. C. Trenholm
Montgomery	Woman's College of Alabama	Walter D. Agnew
Normal	State Agricultural & Mechanical Institute	J. F. Drake
St. Bernard	St. Bernard College	Bernard Menges
Selma	Selma University	Wm. Wade Ryan
Spring Hill	Spring Hill College	Joseph M. Walsh
Talladega	Talladega College	F. A. Sumner
Troy	State Teachers College	E. M. Shackelford
Tuskegee	Tuskegee Institute	Robert R. Moton
University	University of Alabama	George H. Denny
Arizona		
Flagstaff	Arizona State Teachers College	Grady Gammage
Tempe	Arizona State Teachers College	Ralph W. Swetman
Tucson	University of Arizona	H. LeRoy Shantz
Arkansas		
Arkadelphia	Henderson State Teachers College	J. P. Womack
Arkadelphia	Ouachita College	Charles D. Johnson
Batesville	Arkansas College	E. B. Tucker
Clarksville	College of the Ozarks	Wiley L. Hurie
Conway	Arkansas State Teachers College	H. L. McAlister
Conway	Hendrix College	J. H. Reynolds
Fayetteville	University of Arkansas	John C. Futrall
Little Rock	Arkansas Baptist College	S. P. Nelson
Little Rock	Little Rock College	John J. Healy
Pine Bluff	Arkansas State College	John B. Watson
Searcy	Galloway Woman's College	J. H. Reynolds
California		
Angwin	Pacific Union College	William E. Nelson
Arcata	Humboldt State Teachers College	Arthur S. Gist
Berkeley	University of California	Robert G. Sproul
Chico	State Teachers College	R. D. Lindquist
Claremont	Pomona College	C. K. Edmunds
Claremont	Scripps College	Ernest J. Jaqua
Fresno	State Teachers College	F. W. Thomas
La Verne	La Verne College	Ellis M. Studebaker
Los Angeles	California Christian College	Cecil F. Cheverton
Los Angeles	Occidental College	Remsen D. Bird
Los Angeles	University of California at Los Angeles	Ernest C. Moore, Director
Los Angeles	University of Southern California	R. B. von KleinSmid
Mills College	Mills College	A. H. Reinhardt
Pasadena	California Institute of Technology	Robert A. Millikan, Ch. Exec. Council
Pasadena	Pasadena College	Orval J. Nease
Redlands	University of Redlands	Victor L. Duke
St. Mary's College	St. Mary's College	Z. Leo
San Diego	State Teachers College	Edward L. Hardy
San Francisco	State Teachers College	Alex. C. Roberts
San Francisco	University of San Francisco	Edward J. Whelan
San Jose	State Teachers College	T. W. MacQuarrie
San Rafael	Dominican College	M. Raymond
Santa Barbara	State Teachers College	Clarence L. Phelps
Santa Clara	University of Santa Clara	Cornelius J. McCoy
Stanford Univ.	Stanford University	Ray Lyman Wilbur
Stockton	College of the Pacific	Tully C. Knoles
Venice	Loyola University of Los Angeles	Zacheus J. Maher
Whittier	Whittier College	Walter F. Dexter
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Alamosa	Adams State Teachers College of Southern Colorado	Ira Richardson
Boulder	University of Colorado	George Norlin
Colorado Spgs.	Colorado Springs	Charles C. Mierow
Denver	The Regis College	Aloysius A. Breen
Denver	University of Denver	F. M. Hunter
Fort Collins	Colorado Agricultural College	Charles A. Lory
Golden	Colorado School of Mines	M. F. Coolbaugh
Greeley	Colorado State Teachers College	G. W. Frasier
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Loretto	Loretto Heights College	Mary Edmond
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Middletown	Wesleyan University	J. L. McConaughy
New Britain	State Normal School	Herbert D. Welte *
New Haven	Albertus Magnus College	M. Isabel
New Haven	State Normal School	Lester K. Ade *
New Haven	Yale University	James R. Angell
New London	Connecticut College for Women	Katharine Blunt
New London	United States Coast Guard Academy	H. G. Hamlet, Supt.
Storrs	Connecticut Agricultural College	C. C. McCracken
Willimantic	State Normal School	George H. Shafer *
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Wilmington	University of Delaware	Walter Hullihen
District of Columbia		
Washington	The American University	Lucius C. Clark
Washington	Catholic University of America	James H. Ryan
Washington	Gallaudet College	Percival Hall
Washington	Georgetown University	W. Coleman Nevils
Washington	George Washington University	Cloyd Heck Marvin
Washington	Howard University	M. W. Johnson
Washington	National University	Hayden Johnson
Washington	St. John's College	Brother Dorotheus
Washington	Trinity College	Sister Julia
Washington	Washington Missionary	H. H. Hamilton
Washington	J. O. Wilson Teachers College	Edgar C. Higbie
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Tallahassee	Florida State College for Women	Edward Conradi
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Decatur	Agnes Scott College	James R. McCain
Demorest	Piedmont College	Henry C. Newell
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Forsyth	Bessie Tift College	Aquila Chamlee

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Rome	Shorter College	William D. Furry
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Thomasville	Allen Normal School	Mary L. Marden *
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Albion	Albion State Normal School	C. E. Bocock *
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Lewiston	Lewiston State Normal School	J. E. Turner
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Carthage	Carthage College	Jacob Diehl
Charleston	Eastern Illinois State Teachers College	L. C. Lord
Chicago	Armour Institute of Technology	H. M. Raymond
Chicago	Chicago Normal College	Butler Laughlin
Chicago	De Paul University	Francis V. Corcoran
Chicago	Lewis Institute	George N. Carman
Chicago	Loyola University	Robert M. Kelley
Chicago	St. Francis Xavier College for Women	M. Sophia Mitchell
Chicago	University of Chicago	Robert M. Hutchins
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De Kalb	Northern Illinois State Teachers College	Karl L. Adams
Elmhurst	Elmhurst College	Timothy Lehmann
Eureka	Eureka College	Clyde L. Lyon
Evanston	National College of Education	Edna Dean Baker
Evanston	Northwestern University	Walter Dill Scott
Galesburg	Knox College	Albert Britt
Greenville	Greenville College	Leslie R. Marston
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Jacksonville	MacMurray College	C. P. McClelland
Jacksonville	Routt College	James A. Griffin
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Lisle	St. Procopius College	Valentine Kohlbeck
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Quincy	Quincy College	V. A. Fochtman
River Forest	Rosary College	Mary Ruth
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Bloomington	Indiana University	William L. Bryan
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Hanover	Hanover College	A. G. Parker, Jr.
Huntington	Huntington College	C. A. Mummart
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N. Manchester	Manchester College	Otho Winger
Notre Dame	St. Marys College	M. Pauline
Notre Dame	University of Notre Dame	Chas. L. O'Donnell
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Clinton	Wartburg College	Otto L. Proehl
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Dubuque	Clarke College	M. Basiline Bates, Acting
Dubuque	Columbia College	Thomas Conry
Dubuque	University of Dubuque	Paul H. Buchholz
Fairfield	Parsons College	Clarence W. Greene
Fayette	Upper Iowa University	John W. Dickman
Grinnell	Grinnell College	John S. Hollenn, Acting
Indianola	Simpson College	John L. Hillman
Iowa City	State University of Iowa	Walter A. Jessup
Lamoni	Graceland College	G. N. Briggs
Le Mars	Western Union College	D. O. Kime, Acting
Mount Pleasant	Iowa Wesleyan College	James E. Coons
Mount Vernon	Cornell College	H. J. Burgstahler
Oskaloosa	Penn College	H. C. Bedford, Acting
Pella	Central College	John Wesselink
Sioux City	Morningside College	Frank E. Mossman
Storm Lake	Buena Vista College	Evert Leon Jones
University Park	John Fletcher College	Joseph Owen
Kansas		
Atchison	St. Benedict's College	Martin Veth
Baldwin City	Baker University	Wallace B. Fleming
Emporia	College of Emporia	John Bailey Kelly
Emporia	Kansas State Teachers College	Thomas W. Butcher
Hays	Fort Hays Kansas State College	W. A. Lewis
Hesston	Hesston College	Edward Yoder, Acting
Hillsboro	Tabor College	H. W. Lohrenz
Kansas City	Kansas City University	W. O. Jones
Lawrence	University of Kansas	E. H. Lindley
Lindsborg	Bethany College	Ernest F. Pihblad
McPherson	McPherson College	V. F. Schwalm
Manhattan	Kansas City College of Agriculture and Applied Science	Francis D. Farrell
Newton	Bethel College	John W. Kliewer
Ottawa	Ottawa University	Erdmann Smith
Pittsburg	Kansas State Teachers College	W. A. Brandenburg
Salina	Kansas Wesleyan University	Larkin B. Bowers
Salina	Marymount College	Mary Rose
St. Marys	St. Mary's College	Francis J. O'Hern
Sterling	Sterling College	Ross T. Campbell
Topeka	Washburn College	Philip C. King
Wichita	Friends University	W. O. Mendenhall
Wichita	Municipal University of Wichita	H. W. Foght
Winfield	St. John's Lutheran College	A. M. Rehwinkel
Winfield	Southwestern College	R. L. George
Kentucky		
Barbourville	Union College	John Owen Gross
Berea	Berea College	Wm. J. Hutchins
Bowling Green	Western Kentucky State Teachers College	H. H. Cherry
Danville	Centre College	Charles J. Turck
Frankfort	Kentucky State Industrial College	R. B. Atwood
Georgetown	Georgetown College	William B. Jones, Acting
Lexington	Transylvania College	Arthur Braden
Lexington	University of Kentucky	Frank L. McVey
Louisville	Louisville Normal School	E. Breckinridge *
Louisville	Nazareth College	Mary C. Malone
Louisville	Simmons University	....
Louisville	University of Louisville	Raymond A. Kent
Morehead	Morehead State Teachers College	J. Howard Payne
Murray	State Teachers College	Rainey T. Wells
Richmond	Eastern Kentucky State Teachers College	H. L. Donovan

City	Institution	President
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Louisiana		
Baton Rouge	Louisiana State University and Agricultural & Mechanical College	James M. Smith
Baton Rouge	Southern University	J. S. Clark
Lafayette	Southwestern Louisiana Institute	Edwin L. Stephens
Natchitoches	Louisiana State Normal College	W. W. Tison
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New Orleans	H. Sophie Newcomb Memorial College	Pierce Butler
New Orleans	New Orleans University	O. E. Kriege
New Orleans	Straight College	Charles B. Austin, Acting
New Orleans	Tulane University of Louisiana	A. B. Dinwiddie
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Shreveport	Centenary College	George S. Sexton
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Castine	Eastern State Normal School	William D. Hall
Farmington	State Normal School	Wilbert G. Mallett
Fort Kent	Madawaska Training School	Richard F. Crocker
Gorham	State Normal School	Walter E. Russell
Lewiston	Bates College	Clifton D. Gray
Machias	Washington State Normal School	Philip H. Kimball *
Orono	University of Maine	H. S. Boardman
Presque Isle	Aroostook State Normal School	San L. Merriman
Van Buren	St. Mary's College	Daniel F. Sullivan
Waterville	Colby College	Frank W. Johnson
Maryland		
Annapolis	St. John's College	Robert E. Bacon, Acting
Annapolis	United States Naval Academy	T. C. Hart, Supt.
Baltimore	College of Notre Dame of Maryland	M. Ethelbert
Baltimore	Goucher College	David A. Robertson
Baltimore	Johns Hopkins University	Joseph S. Ames
Baltimore	Loyola College	Henri J. Wiesel
Baltimore	Milton University	Wm. Jas. Heaps
Baltimore	Morgan College	J. O. Spencer
Bowie	Maryland Normal School	L. S. James
Chestertown	Washington College	Paul E. Titsworth
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Emmitsburg	St. Joseph's College	Paula Dunn
Frederick	Hood College	Joseph H. Apple
Frostburg	State Normal School	John L. Dunkle *
Lutherville	Maryland College for Women	George A. Steele
Salisbury	Maryland State Normal School	Wm. J. Holloway
Towson	Maryland State Normal School	Lida Lee Tall
Westminster	Western Maryland College	Albert N. Ward
Massachusetts		
Amherst	Amherst College	Arthur S. Pease
Amherst	Massachusetts Agricultural College	Roscoe W. Thatcher
Boston	Boston University	Daniel L. Marsh
Boston	Emmanuel College	Sister Frances
Boston	Northeastern University	Frank P. Speare
Boston	Simmons College	Henry Lefavour
Boston	Teachers College of the City of Boston	Wm. H. J. Kennedy
Bridgewater	State Normal School	Arthur C. Boyden *
Cambridge	Harvard University	A. Lawrence Lowell
Cambridge	Massachusetts Institute of Technology	Karl T. Compton
Cambridge	Radcliffe College	Ada L. Comstock
Chestnut Hill	Boston College	James H. Dolan
Fitchburg	State Normal School	Charles M. Herlihy
Framingham	State Normal School	Francis A. Bagnall
Hyannis	State Normal School	Herbert H. Howes
Lowell	Lowell Textile Institute	Charles H. Eames
Lowell	St. Joseph's College	Bro. Priscillianus
Lowell	State Normal School	Clarence M. Weed
Medford	Tufts College	John A. Cousens
North Adams	State Normal School	Roy Leon Smith
Northampton	Smith College	William A. Neilson
Norton	Wheaton College	John Edgar Park
Salem	State Normal School	J. Asbury Pitman
South Hadley	Mount Holyoke College	Mary E. Woolley
Springfield	American International College	C. S. McGown
Springfield	International Y. M. C. A. College	L. L. Doggett
Wellesley	Wellesley College	Ellen F. Pendleton
Westfield	State Normal School	Charles Russell
Williamstown	Williams College	Harry A. Garfield

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Worcester	College of the Holy Cross	John M. Fox
Worcester	State Normal School	Wm. B. Aspinwall
Worcester	Worcester Polytechnic Institute	R. Earle
Michigan		
Adrian	Adrian College	Harlan L. Feeman
Albion	Albion College	John L. Seaton
Alma	Alma College	Harry M. Crooks
Ann Arbor	University of Michigan	Alex. G. Ruthven
Battle Creek	Battle Creek College	Paul F. Voelker
Berrien Spgs.	Emmanuel Mission College	Lynn H. Wood
Big Rapids	Ferris Institute	Wells D. White
Detroit	College of the City of Detroit	Wilford L. Coffey
Detroit	Detroit Teachers College	W. F. Lessenger, Acting Dean
Detroit	Marygrove College	George H. Derry
Detroit	University of Detroit	John P. McNichols
East Lansing	Michigan State College of Agriculture and Applied Science	Robert S. Shaw
Grand Rapids	Calvin College	R. B. Kuiper
Hillsdale	Hillsdale College	Wm. Gear Spencer
Holland	Hope College	E. D. Dimnent
Houghton	Michigan College of Mining and Technology	Wm. O. Hotchkiss
Kalamazoo	Kalamazoo College	Allan Hoben
Kalamazoo	Western State Teachers College	D. B. Waldo
Marquette	Northern State Teachers College	J. M. Munson
Mt. Pleasant	Central State Teachers College	E. C. Warriner
Nazareth	Nazareth College	M. Agatha Ganley
Olivet	Olivet College	James King
Ypsilanti	Michigan State Normal College	Charles McKenny
Minnesota		
Bemidji	State Teachers College	M. W. Deputy
Collegeville	St. John's University	Alcuin Deutsch
Duluth	State Teachers College	E. W. Bohannon
Madison	Lutheran Normal School	A. K. Feroe
Mankato	State Teachers College	Frank D. McElroy
Minneapolis	Augsburg Seminary & College	George Sverdrup
Minneapolis	University of Minnesota	Lotus D. Coffman
Moorhead	Concordia College	J. N. Brown
Moorhead	State Teachers College	R. B. MacLean
New Ulm	Dr. Martin Luther College	E. R. Bliefernicht
Northfield	Carleton College	Donald J. Cowling
Northfield	St. Olaf College	L. W. Boe
St. Cloud	State Teachers College	George A. Selke
St. Paul	Bethel Institute	G. A. Hagstrom
St. Paul	College of St. Catherine	Sister Antonia
St. Paul	College of St. Thomas	M. Schumacher
St. Paul	Hamline University	Alfred F. Hughes
St. Paul	Macalester College	John C. Acheson
St. Peter	Gustavus Adolphus College	O. J. Johnson
Winona	College of St. Teresa	Mary A. Molloy
Winona	St. Mary's College	John H. Peschges
Winona	State Teachers College	Guy E. Maxwell
Mississippi		
A. & M. College	Mississippi Agricultural & Mechanical College	Hugh Critz
Alcorn	Agricultural & Mechanical College	L. J. Rowan
Blue Mountain	Blue Mountain College	Lawrence T. Lowrey
Clinton	Mississippi College	John W. Provine
Columbus	Mississippi State College for Women	R. E. L. Sutherland
Grenada	Grenada College	J. R. Countiss
Hattiesburg	Mississippi Woman's College	John L. Johnson
Hattiesburg	State Teachers College	Claude Bennett
Holly Springs	Rust College	L. M. McCoy
Jackson	Belhaven College	G. T. Gillespie
Jackson	Jackson College	B. Baldwin Dansby
Jackson	Millsaps College	D. M. Key
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University	University of Mississippi	Joseph N. Powers
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Canton	Culver Stockton College	John H. Wood
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Fulton	Westminster College	M. E. Melvin
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Jefferson City	Lincoln University	N. B. Young
Kansas City	Rockhurst College	Wm. P. Manion
Kansas City	Teachers College of Kansas City	G. W. Diemer
Kirksville	Northeast Missouri State Teachers College	Eugene Fair
Liberty	William Jewell College	John F. Herget

City	Institution	President
Marshall	Missouri Valley College	George H. Mack
Maryville	Northwest Missouri State Teachers College	Uel W. Lamkin
Parkville	Park College	F. W. Hawley
St. Charles	Lindenwood College	John L. Roemer
St. Louis	Harris Teachers College	J. Leslie Purdom
St. Louis	Maryville College	Mary Reid
St. Louis	St. Louis University	Robert S. Johnston
St. Louis	Washington University	George R. Throop
Springfield	Drury College	T. W. Nadal
Springfield	Southwest Missouri State Teachers College	Roy Ellis
Tarkio	Tarkio College	R. N. Montgomery
Warrensburg	Central Missouri State Teachers College	E. L. Hendricks
Warrenton	Central Wesleyan College	Ira N. Chiles
Webster Groves	Webster College	George F. Donovan
Montana		
Billings	Eastern Montana Normal School	L. B. McMullen
Bozeman	Montana State College of Agriculture & Mechanic Arts	Alfred A. Atkinson
Butte	Montana School of Mines	Francis A. Thomson
Dillon	Montana State Normal College	Sheldon E. Davis
Helena	Intermountain Union College	Wendell S. Brooks
Helena	Mount St. Charles College	Nobert C. Hoff
Missoula	State University of Montana	Charles H. Clapp
Nebraska		
Blair	Dana College	Erland Nelson, Acting
Central City	Nebraska Central College	O. W. Carrell
Chadron	Nebraska State Normal College	Robert I. Elliott
Crete	Doane College	Edwin B. Dean
Fremont	Midland College	H. F. Martin
Grand Island	Grand Island College	George Sutherland, Acting
Hastings	Hastings College	Calvin H. French
Kearney	Nebraska State Teachers College	George E. Martin
Lincoln	Cotner College	L. C. Anderson
Lincoln	Nebraska Wesleyan University	I. B. Schreckengast
Lincoln	Union College	P. L. Thompson
Lincoln	University of Nebraska	E. A. Burnett
Omaha	Creighton University	Patrick J. Mahan
Omaha	University of Omaha	Wm. E. Sealock
Peru	State Teachers College	W. R. Pate
Wayne	Nebraska State Teachers College	U. S. Conn
York	York College	J. R. Overmiller
Nevada		
Reno	University of Nevada	Walter E. Clark
New Hampshire		
Durham	University of New Hampshire	Edward M. Lewis
Hanover	Dartmouth College	Ernest M. Hopkins
Keene	Keene Normal School	Wallace E. Mason
Manchester	St. Anselm's College	Bertrand C. Dolan
Plymouth	Plymouth Normal School	Ernest L. Silver
New Jersey		
Convent Station	College of St. Elizabeth	Marie Jose Byrne
East Orange	Upsala College	Carl G. Erickson
Glassboro	New Jersey State Normal School	S. G. Winana
Hoboken	St. Peter's College	Joseph P. O'Reilly
Jersey City	Stevens Institute of Technology	Harvey N. Davis
Jersey City	State Normal School at Jersey City	W. Allen Messler *
Lakewood	Georgian Court College	M. Cecelia Scully
Madison	Drew University	Arlo Ayres Brown
Montclair	New Jersey State Teachers College	Harry A. Sprague
Newark	Newark College of Engineering	Allan R. Cullimore
Newark	New Jersey State Normal School	M. Ernest Townsend
New Brunswick	Rutgers University	Philip M. Brett, Acting
Paterson	New Jersey State Normal School	Roy L. Shaffer
Princeton	Princeton University	John Grier Hibben
Princeton	St. Joseph College	Joseph S. Dunn
South Orange	Seton Hall College	T. H. McLaughlin
Trenton	State Teachers College & Normal School	Roscoe L. West
Zarephath	Alma White College	Arthur K. White
New Mexico		
Albuquerque	University of New Mexico	J. F. Zimmerman
E. Las Vegas	New Mexico Normal University	Frank Carroon
El Rito	Spanish-American Normal School	John V. Conway
Silver City	New Mexico State Teachers College	A. O. Bowden
Socorro	New Mexico School of Mines	E. H. Wells
State College	New Mexico College of Agriculture & Mechanic Arts	H. L. Kent
New York		
Albany	St. Rose's College	Edmund F. Gibbons
Albany	State College for Teachers	A. R. Brubacher
Alfred	Alfred University	Boothe C. Davis
Annandale	St. Stephen's College	Bernard I. Bell, Warden
Aurora	Wells College	Kerr D. Macmillan
Brockport	State Normal School	Alfred C. Thompson
Brooklyn	Long Island University	George R. Hardie, Dean
Brooklyn	Maxwell Training School for Teachers	Frederick L. Holtz*
Brooklyn	Polytechnic Institute of Brooklyn	Parke R. Kolbe
Brooklyn	Saint Francis College	Bro. Columba
Brooklyn	St. John's College	John J. Cloonan
Brooklyn	St. Joseph's College for Women	Thomas E. Molloy
Buffalo	Canisius College	R. J. Eichhorn
Buffalo	D'Youville College	Saint Edward
Buffalo	State Teachers College	Harry W. Rockwell
Buffalo	The University of Buffalo	Samuel Paul Capen
Canton	St. Lawrence University	Richard E. Sykes
Clinton	Hamilton College	Frederick C. Ferry
Cortland	State Normal School	H. De W. DeGroat
Elmira	Elmira College	Frederick Lent
Fredonia	State Normal School	Hermann Cooper
Garden City	Adelphi College	Frank D. Blodgett
Geneseo	State Normal School	W. A. Holcomb
Geneva	Hobart College	Murray Bartlett
Hamilton	Colgate University	George B. Cutten
Houghton	Houghton College	James S. Luckey
Ithaca	Cornell University	Livingston Farrand
Jamaica	Jamaica Training School for Teachers	M. E. Rogalin *
Keuka Park	Keuka College	A. H. Norton
New Paltz	State Normal School	L. H. Van Den Berg
New Rochelle	College of New Rochelle	John P. Chidwick
New York	Barnard College	V. C. Gildersleeve
New York	College of the City of New York	F. B. Robinson
New York	College of Mount St. Vincent	Cardinal Hayes
New York	College of The Sacred Heart	Grace C. Dammann
New York	Columbia University	Nicholas M. Butler
New York	Cooper Union	R. Fulton Cutting
New York	Fordham University	Aloysius J. Hogan
New York	Hunter College of the City of N. Y.	James M. Kieran
New York	Manhattan College	Brother Cornelius
New York	New York University	E. E. Brown
New York	Teachers College, Columbia University	Wm. F. Russell
Niagara Univ.	Niagara University	John J. O'Byrne
Oneonta	Hartwick College	Chas. W. Leitzell
Oneonta	State Normal School	Percy I. Bugbee
Oswego	State Normal School	James G. Riggs
Plattsburgh	State Normal School	George J. Hawkins
Potsdam	Clarkson College of Technology	Joseph E. Rowe
Potsdam	State Normal School	R. T. Congdon *
Poughkeepsie	Vassar College	H. N. MacCracken
Rochester	Nazareth College	M. Sylvester
Rochester	Rochester City Normal School	Edward J. Bonner
Rochester	University of Rochester	Rush Rhees
St. Bonaventure	St. Bonaventure's College	Thomas Plassmann
Saratoga Spgs.	Skidmore College	Henry I. Moore
Schenectady	Union College	Frank P. Day
Staten Island	Wagner Memorial Lutheran College	Frederick Sutter, Acting
Syracuse	New York State College of Forestry	Hugh P. Baker
Syracuse	Syracuse City Normal School	Wm. W. Wright *
Syracuse	Syracuse University	Chas. Wesley Flint
Tarrytown	Marymount College	M. Gerard
Troy	Rensselaer Polytechnic Institute	Palmer C. Ricketts
Troy	Russell Sage College	J. L. Meader
West Point	United States Military Academy	W. R. Smith, Supt.
White Plains	Good Counsel College	M. Aloysia
North Carolina		
Asheville	Asheville Normal & Teachers College	John E. Calfee
Belmont	Belmont Abbey College	Thomas Oestereich
Chapel Hill	University of North Carolina	Frank P. Graham
Charlotte	John C. Smith University	H. L. McCrorey
Charlotte	Queens Chicora College	W. H. Frazer
Conover	Concordia	H. B. Hemmeter

City	Institution	President
Cullowhee	Western Carolina Teachers College	H. T. Hunter
Davidson	Davidson College	Walter L. Lingle
Durham	Duke University	Wm Preston Few
Durham	North Carolina College for Negroes	James E. Shepard
Elizabeth City	State Normal School	J. H. Bias
Elon College	Elon College	W. A. Harper
Fayetteville	State Normal School	E. E. Smith
Greensboro	Greensboro College	S. B. Turrentine
Greensboro	North Carolina College for Women	Julius I. Foust
Greenville	East Carolina Teachers College	Robert H. Wright
Guilford College	Guilford College	Raymond Binford
Hickory	Lenoir Rhyne College	H. B. Schaeffer
High Point	High Point College	G. I. Humphreys
Kittrell	Kittrell College	D. K. Cherry
Murfreesboro	Chowan College	W. B. Edwards
Raleigh	Meredith College	Charles E. Brewer
Raleigh	North Carolina State College of Agriculture & Engineering	Eugene C. Brooks
Raleigh	Shaw University	....
Red Springs	Flora MacDonald College	Henry G. Bedinger
Salisbury	Catawba	....
Salisbury	Livingstone College	W. J. Trent
Wake Forest	Wake Forest	Thurman D. Kitchin
Wilson	Atlantic Christian College	H. S. Hilley
Winston-Salem	Salem College	H. F. Rondthaler
Winston-Salem	Winston-Salem Teachers College	S. G. Atkins
North Dakota		
Dickinson	State Normal School	C. J. Kjerstad
Ellendale	State Normal & Industrial School	R. M. Black
Fargo	North Dakota Agricultural College	John H. Sheppard
Grand Forks	Wesley College	Charles L. Wallace
Jamestown	Jamestown College	B. H. Kroeze
Mayville	State Teachers College	Carl C. Swain
Minot	State Teachers College	G. A. McFarland
University	University of North Dakota	Thomas F. Kane
Valley City	State Teachers College	C. E. Allen
Ohio		
Ada	Ohio Northern University	Robert Williams
Akron	University of Akron	George F. Zook
Alliance	Mount Union College	Wm. H. McMaster
Ashland	Ashland College	Edwin E. Jacobs
Athens	Ohio University	Elmer B. Bryan
Berea	Baldwin-Wallace College	Albert B. Storms
Bluffton	Bluffton College	Samuel K. Mosiman
Bowling Green	Bowling Green State College	H. B. Williams
Cedarville	Cedarville College	W. R. McChesney
Cincinnati	College of the Sacred Heart	Frances Sullivan
Cincinnati	St. Xavier College	Hugo F. Sloctemyer
Cincinnati	University of Cincinnati	Herman Schneider
Cleveland	John Carroll University	B. J. Rodman
Cleveland	Case School of Applied Science	Wm. E. Wickenden
Cleveland	School of Education Western Reserve University	Charles W. Hunt
Cleveland	Ursuline College	Mary Eulalia
Cleveland	Western Reserve University	Robert E. Vinson
Columbus	Columbus Normal School	Vance M. Smith *
Columbus	Capital University	Otto Mees
Columbus	Ohio State University	G. W. Rightmire
Dayton	University of Dayton	Bernard P. O'Reilly
Defiance	Defiance College	A. G. Caris
Delaware	Ohio Wesleyan University	Edmund D. Soper
Findlay	Findlay College	H. R. Dunathan
Gambier	Kenyon College	Wm. F. Peirce
Granville	Denison University	A. A. Shaw
Hiram	Hiram College	Kenneth I. Brown
Kent	Kent State College	J. O. Engelman
Marietta	Marietta College	Edward S. Parsons
Mount St. Joseph	Mount St. Joseph College	Mother Irenaea
New Concord	Muskingum College	J. K. Montgomery
Oberlin	Oberlin College	Ernest H. Wilkins
Oxford	Miami University	Alfred H. Upham
Oxford	Western College for Women	Ralph K. Hickok
Painesville	Lake Erie College	Vivian B. Small
Rio Grande	Rio Grande College	W. W. Bartlett
South Euclid	Notre Dame College	Mary Evarista
Springfield	Wittenberg College	Rees Edgar Tulloss
Tiffin	Heidelberg College	Charles E. Miller
Toledo	St. John's University	Wm. H. Fitzgerald
Toledo	University of the City of Toledo	Henry J. Doermann
Westerville	Otterbein College	W. G. Clippinger
Wilberforce	Wilberforce University	Gilbert H. Jones
Wilmington	Wilmington College	Beverly O. Skinner
Wooster	The College of Wooster	Charles F. Wishart
Yellow Springs	Antioch College	Arthur E. Morgan
Oklahoma		
Ada	East Central State Teachers College	A. Linscheid
Alva	Northwestern State Teachers College	W. W. Parker
Chickasha	Oklahoma College for Women	M. A. Nash
Durant	Southwestern Teachers College	Eugene S. Briggs
Edmond	Central State Teachers College	John G. Mitchell
Enid	Phillips University	I. N. McCash
Goodwell	Panhandle Agricultural & Mechanical College	A. W. Fanning
Guthrie	Catholic College of Oklahoma for Women	Mary Agnes Arvin
Langston	Colored Agricultural & Normal University	Z. T. Hubert
Norman	University of Oklahoma	Wm. B. Bizzell
Oklahoma City	Oklahoma City University	Eugene M. Antrim
Shawnee	Oklahoma Baptist University	Wm. C. Boone
Stillwater	Oklahoma Agricultural & Mechanical College	Henry G. Bennett
Tahlequah	Northeastern State Teachers College	M. P. Hammond
Tulsa	University of Tulsa	John D. Finlayson
Weatherford	Southwestern State Teachers College	E. E. Brown
Wilburton	Eastern Oklahoma College	E. E. Tourtellotte
Oregon		
Albany	Albany College	Thomas W. Bibb
Ashland	Southern Oregon State Normal School	J. A. Churchill
Corvallis	Oregon State Agricultural College	Wm. J. Kerr
Eugene	University of Oregon	Arnold B. Hall
Forest Grove	Pacific University	John F. Dobbs
La Grande	Eastern Oregon Normal School	H. E. Inlow
McMinnville	Linfield College	Leonard W. Riley
Monmouth	Oregon Normal School	J. S. Landers
Newberg	Pacific College	Levi T. Pennington
Portland	Reed College	N. F. Coleman
Salem	Willamette University	Carl G. Doney
Pennsylvania		
Allentown	Cedar Crest College	Wm. F. Curtis
Allentown	Muhlenberg College	John A. W. Haas
Annville	Lebanon Valley College	George D. Cossard
Beaver Falls	Geneva College	M. M. Pearce
Bethlehem	Lehigh University	Chas. R. Richards
Bethlehem	Moravian College	Wm. N. Schwarze
Bethlehem	Moravian College for Women	Edwin J. Heath
Bloomsburg	State Teachers College	Francis B. Haas
Bryn Athyn	Academy of the New Church	N. D. Pendleton
Bryn Mawr	Bryn Mawr College	Marion E. Park
California	State Teachers College	Robert M. Steele
Carlisle	Dickinson College	James H. Morgan
Chambersburg	Wilson College	E. D. Warfield
Chester	Pennsylvania Military College	Frank K. Hyatt
Chestnut Hill	Mount St. Joseph College	Mary James
Cheyney	Cheyney Training School for Teachers	L. P. Hill
Clarion	State Teachers College	G. C. L. Riemer
Collegeville	Ursinus College	George L. Omwake
Easton	Lafayette College	Wm. Mather Lewis
East Stroudsburg	State Teachers College	T. T. Allen
Edinboro	State Teachers College	C. C. Crawford
Elizabethtown	Elizabethtown College	Ralph W. Schlosser
Gettysburg	Gettysburg	H. W. A. Hanson
Greensburg	Seton Hill College	J. A. W. Reeves
Greenville	Thiel College	E. Clyde Xander
Grove City	Grove City College	Weir C. Ketler
Haverford	Haverford College	W. W. Comfort
Herman	St. Fidelis Seminary	P. Hohman, Dir.
Huntingdon	Juniata College	Charles C. Ellis
Immaculata	Immaculata College	Anthony J. Flynn
Indiana	State Teachers College	C. R. Foster
Jenkintown	Beaver College	W. B. Greenway
Kutztown	State Teachers College	A. C. Rothermel
Lancaster	Franklin & Marshall College	Henry H. Apple
Latrobe	St. Vincent College	Alfred Koch
Lewisburg	Bucknell University	Emory W. Hunt
Lincoln Univ.	Lincoln University	Wm. H. Johnson
Lock Haven	State Teachers College	D. W. Armstrong
Loretto	St. Francis College	Raphael Breheny
Mansfield	State Teachers College	W. R. Straughn
Meadville	Allegheny College	C. F. Ross, Acting
Millersville	State Teachers College	Landis Tanger

City	Institution	President
New Wilmington	Westminster College	Charles Freeman, Acting
Philadelphia	Drexel Institute	K. G. Matheson
Philadelphia	Dropsie College	Cyrus Adler
Philadelphia	La Salle College	E. Alfred
Philadelphia	St. Joseph's College	Wm. T. Tallon
Philadelphia	Temple University	Charles E. Beury
Philadelphia	University of Pennsylvania	Thomas S. Gates
Pittsburgh	Carnegie Institute of Technology	Thomas S. Baker
Pittsburgh	Duquesne University of the Holy Ghost	J. J. Callahan
Pittsburgh	H. C. Frick Training School for Teachers	H. L. Spencer *
Pittsburgh	Pennsylvania College for Women	Cora H. Coolidge
Pittsburgh	University of Pittsburgh	John G. Bowman
Reading	Albright College	Warren F. Teel
Rosemont	Rosemont College	Mary Ignatius
Scranton	Marywood College	Mary William
Scranton	St. Thomas College	George Lewis
Selinsgrove	Susquehanna University	G. Morris Smith
Shippensburg	State Teachers College	Ezra Lehman
Slippery Rock	State Teachers College	J. L. Eisenberg
State College	Pennsylvania State College	Ralph D. Hetzel
Swarthmore	Swarthmore College	Frank Aydelotte
Villanova	Villanova College	James H. Griffin
Washington	Washington & Jefferson College	S. S. Baker
Waynesburg	Waynesburg	Paul R. Stewart
West Chester	State Teachers College	N. W. Cameron
Rhode Island		
Providence	Brown University	C. A. Barbour
Providence	Providence College	L. C. McCarthy
Providence	Rhode Island College of Education	John L. Alger
Kingston	Rhode Island State College	Ray. G. Bressler
South Carolina		
Anderson	Anderson College	Annie D. Denmark
Charleston	The Citadel—The Military College of South Carolina	Chas. P. Summerall
Charleston	College of Charleston	Harris Randolph
Clemson College	Clemson Agricultural College	Enoch W. Sikes
Clinton	Presbyterian College	John McSween
Columbia	Allen University	D. H. Sims
Columbia	Benedict College	J. J. Starke
Columbia	Columbia College	J. Caldwell Guilds
Columbia	University of South Carolina	D. McD. Douglas
Due West	Erskine College	Robert C. Grier
Gaffney	Limestone College	R. C. Cranberry
Greenville	Furman University	W. J. McGlothlin
Greenville	Greenville Womens College	H. W. Provence
Greenwood	Lander College	Richard H. Bennett
Hartsville	Coker College	Carlyle Campbell
Newberry	Newberry College	James C. Kinard
Orangeburg	Cliflin College	J. B. Randolph
Orangeburg	Colored Normal, Industrial Agricultural and Mechanical College	R. S. Wilkinson
Rock Hill	Winthrop College	J. Pinckney Kinard
Spartanburg	Converse College	Robert P. Pell
Spartanburg	Wofford College	Henry N. Snyder
South Dakota		
Aberdeen	Northern Normal & Industrial School	D. A. Anderson
Brookings	South Dakota State College of Agriculture & Mechanic Arts	C. W. Pugsley
Huron	Huron College	Royal Clyde Agne
Madison	Eastern State Teachers College	E. A. Bixler, Acting
Mitchell	Dakota Wesleyan University	Earl A. Roadman
Rapid City	State School of Mines	C. C. O'Harra
Sioux Falls	Augustana College	O. J. H. Preus
Sioux Falls	Sioux Falls College	C. R. Sattgast
Spearfish	Spearfish Normal School	E. C. Woodburn
Springfield	Southern State Teachers College	C. G. Lawrence
Vermilion	University of South Dakota	Herman G. James
Yankton	Yankton College	G. W. Nash
Tennessee		
Bristol	King College	Tilden Scherer
Chattanooga	University of Chattanooga	Alexander Guerry
Clarksville	Austin Peay Normal School	P. P. Claxton
Cookeville	Tennessee Polytechnic Institute	Q. M. Smith
Greenville	Tusculum College	C. A. Anderson

City	Institution	President
Harrogate	Lincoln Memorial University	H. R. Shipherd
Jackson	Lambuth College	Ricard E. Womack
Jackson	Lane College	J. F. Lane
Jackson	Union University	H. E. Watters
Jefferson City	Carson & Newman College	James T. Warren
Johnson City	State Teachers College	C. C. Sherrod
Knoxville	Knoxville College	J. Kelly Giffen
Knoxville	University of Tennessee	H. A. Morgan
Lebanon	Cumberland University	Ernest L. Stockton
McKenzie	Bethel College	Edgar B. McEuen
Madison	Nashville Agricultural Normal Institute	Edw. A. Sutherland
Maryville	Maryville College	Ralph Waldo Lloyd
Memphis	Southwestern	Charles E. Diehl
Memphis	State Teachers College	J. W. Brister
Memphis	Roger Williams College	T. O. Fuller
Milligan College	Milligan College	H. J. Derthick
Murfreesboro	State Teachers College	P. A. Lyon
Murfreesboro	Tennessee College for Women	E. L. Atwood
Nashville	Fisk University	Thomas E. Jones
Nashville	George Teabody College for Teachers	Bruce R. Payne
Nashville	Tennessee Agricultural & Industrial State Teachers College	W. J. Hale
Nashville	Vanderbilt University	James H. Kirkland
Rogersville	Swift Memorial College	C. E. Tucker
Sewanee	University of the South	Benj. F. Finney
Washington College	Washington College	Hubert S. Lyle
Texas		
Abilene	Abilene Christian College	Batsell Baxter
Abilene	McMurry College	J. W. Hunt
Abilene	Simmons University	J. D. Sandefer
Alpine	Sul Ross State Teachers College	H. W. Morelock
Austin	St. Edward's University	Joseph Burke
Austin	The University of Texas	H. Y. Benedict
Belton	Baylor College for Women	J. C. Hardy
Brownwood	Daniel Baker College	S. E. Chandler
Brownwood	Howard Payne College	Thomas H. Taylor
Canyon	West Texas State Teachers College	J. A. Hill
College Station	Agricultural & Mechanical College of Texas	T. O. Walton
Commerce	East Texas State Teachers College	Sam H. Whitley
Dallas	Southern Methodist University	Chas. C. Selecman
Denton	North Texas State Teachers College	R. L. Marquis
Denton	Texas State College of Women	Louis H. Hubbard
Fort Worth	Texas Christian University	Edward McS. Waits
Fort Worth	Texas Woman's College	H. E. Stout
Georgetown	Southwestern University	King Vivion
Houston	The Rice Institute	Edgar Odell Lovett
Houston	St. Thomas College	T. P. O'Rourke
Huntsville	Sam Houston State Teachers College	H. F. Estill
Kingsville	Texas College of Arts & Industries	R. B. Cousins
Lubbock	Texas Technological College	Paul W. Horn
Marshall	Bishop College	Joseph J. Rhoads
Marshall	Wiley College	M. W. Dogan
Nacogdoches	Stephen F. Austin State Teachers College	A. W. Birdwell
Prairie	Prairie View State Industrial College	W. R. Banks
San Antonio	Incarnate Word College	M. Columkille
San Antonio	Our Lady of the Lake College	M. Angelique
San Antonio	St. Mary's College	Alfred H. Rabe
San Marcos	Southwest Texas State Teachers College	C. E. Evans
Seguin	Guadalupe College	J. R. Lockett
Sherman	Austin College	Everett B. Tucker
Waco	Baylor University	Samuel P. Brooks
Waxahachie	Trinity University	John H. Burma
Utah		
Logan	Utah State Agricultural College	Elmer G. Peterson
Provo	Brigham Young University	Franklin S. Harris
Salt Lake City	University of Utah	George Thomas
Vermont		
Burlington	University of Vermont & State Agricultural College	Guy W. Bailey
Castleton	State Normal School	C. S. Woodruff *
Middlebury	Middlebury College	Paul D. Moody
Northfield	Norwich University	Chas. A. Plumley
Winooski	St. Michael's College	Wm. Jean Marie

City	Institution	President
Virginia		
Ashland	Randolph Macon College	Rob't E. Blackwell
Blacksburg ...	Virginia Agricultural & Mechanical College & Polytechnic Institute	Julian A. Burruss
Bridgewater ..	Bridgewater College	Paul H. Bowman
Charlotteville	University of Virginia	Edwin A. Alderman
East Redford	State Teachers College	John P. McConnell
Emory	Emory & Henry College	J. N. Hillman
Ettrick	Virginia State College	John M. Gandy
Farmville ...	State Teachers College	J. L. Jarman
Fredericksburg	State Teachers College	Morgan L. Combs
Hampden-Sydney	Hampden-Sydney College	J. D. Eggleston
Hampton	Hampton Institute	Arthur Howe
Harrisonburg .	State Teachers College	S. P. Duke
Hollins	Hollins College	Matty L. Cocke
Lexington	Virginia Military Institute	J. A. Lejeune, Supt.
Lexington	Washington & Lee University	Francis P. Gaines
Lynchburg ...	Lynchburg College	J. T. T. Hundley
Lynchburg ...	Randolph Macon Woman's College	Dice R. Anderson
Lynchburg ...	Virginia Theological Seminary and College	Vernon Johns
Petersburg ...	Virginia State College	John M. Gandy
Richmond	Richmond Normal School	W. D. Ellis
Richmond	University of Richmond	F. W. Boatwright
Richmond	Virginia Union University	William J. Clark
Salem	Roanoke College	Chas. J. Smith
Staunton	Mary Baldwin College	L. Wilson Jarman
Sweet Briar ..	Sweet Briar College	Meta Glass
Williamsburg	College of William & Mary	J. A. C. Chandler
Washington		
Bellingham ..	State Normal School	C. H. Fisher
Cheney	State Normal School	R. T. Hargreaves
College Place	Walla Walla College	John E. Weaver
Ellensburg ...	Washington State Normal School	Selden Smyser, Acting
Pullman	State College of Washington	Ernest O. Holland
Seattle	Seattle Pacific College	Charles H. Watson
Seattle	University of Washington	Matthew L. Spencer
Spokane	Gonzaga University	John J. Keep
Spokane	Spokane University	Roy K. Roadruck
Spokane	Whitworth	Ward W. Sullivan
Tacoma	College of Puget Sound	Edward H. Todd
Walla Walla .	Whitman College	S. B. L. Penrose
West Virginia		
Athens	Concord State Teachers College	J. Frank Marsh
Barboursville .	Morris Harvey College	David Kirby
Bethany	Bethany College	Cloyd Goodnight
Bluefield	Bluefield State Teachers College	R. P. Sims
Buckhannon ..	West Virginia Wesleyan College	Homer E. Wark
Elkins	Davis & Elkins College	James E. Allen
Fairmont	Fairmont State Teachers College	Joseph Rosier
Glenville	Glenville State Normal School	E. G. Rohrbough
Huntington ..	Marshall College	M. P. Shawkey
Institute ...	West Virginia State College	John W. Davis
Morgantown ..	West Virginia University	John R. Turner
Salem	Salem College	S. Orestes Bond
Shepherdstown	Shepherd College State Normal School	W. H. S. White
West Liberty .	West Liberty State Normal School	J. S. Bonar
Wisconsin		
Appleton	Lawrence College	Henry M. Wriston
Ashland	Northland College	J. D. Brownell
Beloit	Beloit College	Irving Maurer
Eau Claire ...	State Teachers College	H. A. Schofield
La Crosse ...	State Teachers College	Geo. M. Snodgrass
Madison	University of Wisconsin	Glenn Frank
Menomonie ...	The Stout Institute	Burton E. Nelson
Milton	Milton College	Jay W. Crofoot
Milwaukee ...	Concordia College	G. C. Barth
Milwaukee ...	Marquette University	William M. Magee
Milwaukee ...	Milwaukee-Downer College	Lucia R. Briggs
Milwaukee ...	Mount Mary College	Edw. A. Fitzpatrick
Milwaukee ...	State Teachers College	Frank E. Baker
Oshkosh	State Teachers College	Earl A. Clemans, Acting
Platteville ...	State Teachers College	Asa M. Royce
Plymouth	Mission House College	J. Friedli, Acting
Ripon	Ripon College	Silas Evans
River Falls ..	State Teachers College	J. H. Ames
Stevens Point	State Teachers College	Frank S. Hyer
Superior	State Teachers College	A. D. S. Gillett
Watertown ...	Northwestern College	Erwin E. Kowalke
Waukesha	Carroll College	Wm. A. Ganfield
Whitewater ..	State Teachers College	C. M. Yoder
Wyoming		
Laramie	University of Wyoming	Arthur G. Crane
Canada		
Antigonish, N. S.	St. Francis Xavier University	H. P. MacPherson
Aurora, Ont. .	St. Andrew's College	D. B. MacDonald, Headmaster
Belleville, Ont.	Albert College	Charles W. Bishop *
Charlottetown P. E. I. ...	St. Dunstan's University	J. A. Murphy
Calgary, Alta. .	Mount Royal College	G. W. Kerby *
Edmonton, Alta.	University of Alberta	R. C. Wallace
Edmonton, Alta.	Alberta College North	F. S. McCall *
Fredericton, N. B.	University of New Brunswick	C. C. Jones
Halifax, N. S. .	Dalhousie University	A. S. Mackenzie
Halifax, N. S. .	Halifax Ladies College and Conservatory of Music	....
Halifax, N. S. .	University of King's College	A. H. Moore
Hamilton, Ont.	McMaster University	H. P. Whidden, Chancellor
Kingston, Ont.	Queen's University	W. H. Fyfe *
Kitchener, Ont.	St. Jerome's College	Robert S. Dehler
Lennoxville, Que.	University of Bishop's College	A. H. McGreer *
London, Ont. .	University of Western Ontario	Wm. Sherwood Fox
Montreal, Que.	Lower Canada College	C. S. Fosbery
Montreal, Que.	Loyola	Thos. J. MacMahon
Montreal, Que.	McGill University	Arthur W. Currie
Montreal, Que.	Montreal University	A. J. V. Piette *
Ottawa, Ont. .	University of Ottawa	G. Marchand
Ottawa, Ont. .	Ottawa University Normal School	Rene Lamoureux *
Quebec, Que. .	Laval University	J. Fillion
Regina, Sask. .	Regina College	E. W. Stapleford
Saskatoon, Sask.	University of Saskatchewan	W. C. Murray
Ste. Anne de Bellevue, Que.	MacDonald College	Arthur W. Currie
St. Joseph, N. B.	St. Joseph's University	H. A. Vanier
St. Thomas Ont.	Alma College	P. S. Dobson *
Stanstead, Que.	Stanstead Wesleyan College	T. A. Halpenny *
Toronto, Ont. .	Havergal College	Marian Wood *
Toronto, Ont. .	University of Toronto	Robt. A. Falconer
Toronto, Ont. .	Upper Canada College	W. L. Grant *
Toronto, Ont. .	Victoria University	E. W. Wallace
Truro, N. S...	College of Agriculture	J. M. Trueman *
Vancouver, B. C.	University of British Columbia	Leonard S. Klinck
Winnipeg, Man	St. John's College	W. Burman, Headmaster
Winnipeg, Man.	University of Manitoba	James A. MacLean
Winnipeg, Man.	Wesley College	John H. Riddell
Wolfville, N. S.	Arcadia University	F. W. Patterson
Outlying Possessions		
Fairbanks, Alaska	Alaska Agricultural College and School of Mines	Charles E. Bunnell
Honolulu, Hawaii	Territorial Normal & Training School	Benjamin O. West
Honolulu, Hawaii	University of Hawaii	David L. Crawford
Manila, P. I. .	Philippine Normal School	R. K. Gilmore
Manila, P. I. .	University of the Philippines	Rafael Palma
Rio Piedras, Porto Rico .	University of Porto Rico	Carlos E. Chardon

Section XII

SUPERINTENDENTS OF SCHOOLS IN PLACES OF 5,000 POPULATION AND OVER

In the following list are included all places which are known to have a superintendent of schools and which, according to the 1930 Federal Census, have a population of 5,000 or over. These include incorporated cities, towns, boroughs and villages, unincorporated towns (in New England), and townships classified as urban by the Bureau of the Census. The names of the superintendents have been revised to May, 1931.

REFERENCES

(a) County superintendent. (c) Acting.
(b) Parish superintendent. (d) Division superintendent.

City	*Superintendent*
Alabama	
Alabama City	George W. Floyd
Andalusia	C. L. Martin
Anniston	S. E. Alverson
Bessemer	J. E. Bryan
Birmingham	C. B. Glenn
Decatur	W. W. Benson
Dothan	C. C. Moseley
Eufaula	T. G. Wilkinson
Fairfield	B. B. Baker
Florence	F. T. Appleby
Gadsden	C. A. Donehoo
Homewood	....
Huntsville	W. G. Hamm
Jasper	W. P. Snuggs
Lanett	C. E. Lunceford
Mobile	W. C. Griggs
Montgomery	W. R. Harrison
Opelika	J. W. Watson
Phenix City	L. P. Stough
Selma	P. M. Munro
Sheffield	L. E. Creel
Talladega	Judson Snead
Tarrant	W. A. Parker
Troy	L. D. Bynum
Tuscaloosa	J. M. Burnett
Arizona	
Bisbee	George E. Brown
Douglas	J. E. Carlson, Jr.
Globe	F. E. Webb
Miami	C. K. Davis
Nogales	A. J. Mitchell
Phoenix	John D. Loper
Prescott	Edward F. Honn
Tucson	C. E. Rose
Arkansas	
Blytheville	Crawford Greene
Camden	F. W. Whiteside
Conway	W. D. Jeter
El Dorado	Charles E. Dicken
Fayetteville	Frank S. Root
Fort Smith	J. W. Ramsey
Helena	J. F. Wahl
Hope	Miss Beryl Henry
Hot Springs National Park	Harvey H. Haley
Jonesboro	Fred Keller
Little Rock	R. C. Hall
Malvern	J. L. Pratt
No. Little Rock	W. E. Phipps
Paragould	J. Will Pierce
Pine Bluff	J. R. Allen
Russellville	W. S. Williams
Texarkana	P. N. Bragg
Van Buren	D. M. Riggin
California	
Alameda	Wm. G. Paden
Albany	John Franklin West
Alhambra	F. V. Routt
Anaheim	M. A. Gauer
Arcadia	H. F. Aker
Bakersfield	L. E. Chenoweth
Bell	Alex Verhusen
Belvidere	....
Berkeley	Lewis W. Smith
Beverly Hills	E. J. Hummel
Brawley	G. R. McIntire
Burbank	F. A. Henderson
Burlingame	L. D. Henderson
Calexico	D. P. Choisser
Chico	C. H. Camper
Colton	J. H. Waldron
Compton	J. Wm. Gastrich
Corona	Glen D. Wight
Coronado	F. A. Boyer
Culver City	Bessie O. Brown
Daly City	W. J. Savage
Downey	Spencer V. Williams
El Centro	B. M. Gruwell
Eureka	G. B. Albee
Fresno	O. S. Hubbard
Fullerton	R. E. Green
Gardena	....
Glendale	R. D. White
Hanford	C. E. Denham
Hawthorne	O. F. Munson
Hayward	....
Huntington Park	C. L. Johns (Elementary) K. L. Stockton (High)
Inglewood	G. W. Crozier
Lodi	W. E. Wiley
Long Beach	W. L. Stephens
Los Angeles	F. A. Bouelle
Lynwood	Coral F. Mercer
Martinez	Alice E. Kelly
Marysville	W. A. Kynoch (Elementary) Curtis E. Warren (High)
Maywood	....
Merced	C. S. Clark
Modesto	J. H. Bradley
Monrovia	A. R. Clifton
Montebello	Mark R. Jacobs
Monterey	J. H. Graves (Elementary) J. R. McKillop (High)
Monterey Park	....
Napa	E. E. Crawford
National City	B. H. Gibbon
Oakland	W. E. Givens
Ontario	C. W. Randall
Orange	G. C. Sherwood
Oxnard	R. B. Haydock
Pacific Grove	R. H. Down
Palo Alto	A. C. Barker
Pasadena	J. A. Sexson
Petaluma	Bruce H. Painter
Piedmont	Harry W. Jones
Pittsburg	F. S. Ramsdell
Pomona	Emmett Clark
Porterville	C. E. Bigham
Redlands	H. G. Clement
Redondo Beach	E. B. Thomas
Redwood City	John Gill
Richmond	W. T. Helms
Riverside	Ira C. Landis
Roseville	W. T. Eich
Sacramento	C. C. Hughes
Salinas	Arthur Walter
San Bernardino	Lewis E. Adams
San Diego	Walter H. Hepner
San Fernando	....
San Francisco	J. M. Gwinn
San Gabriel	R. B. Walter
San Jose	W. L. Bachrodt
San Leandro	W. O. Davies
San Luis Obispo	Charles E. Teach
San Mateo	George W. Hall (Elementary) Homer Martin (High)
San Rafael	O. R. Hartzell
Santa Ana	J. A. Cranston
Santa Barbara	P. E. Stewart
Santa Clara	C. W. Townsend
Santa Cruz	C. R. Holbrook
Santa Maria	Robert Bruce
Santa Monica	F. F. Martin
Santa Paula	George A. Bond
Santa Rosa	Jerome O. Cross
South Gate	....
South Pasadena	George C. Bush
South San Francisco	A. C. Kleemeyer
Stockton	Ansel S. Williams
Torrance	....
Tulare	S. J. Brainerd
Vallejo	Elmer L. Cave
Ventura	E. L. Van Dellen
Visalia	DeWitt Montgomery
Watsonville	T. S. MacQuiddy
Whittier	S. H. Thompson (Elementary) D. A. Stouffer (High)
Woodland	....
Colorado	
Alamosa	G. P. Young
Boulder	William V. Casey
Canon City	L. L. Beahm
Colorado Springs	H. M. Corning
Denver	A. L. Threlkeld
Durango	Emory E. Smiley
Englewood	Gary Gordon
Fort Collins	Ward I. Miller
Grand Junction	R. E. Tope
Greeley	I. E. Stutsman
La Junta	Robert M. Tirey
Longmont	W. D. Blaine
Loveland	R. W. Truscott
Pueblo	District No. 1, J. H. Risley District No. 20, J. F. Keating

City	Superintendent
Salida	L. D. Hightower
Sterling	R. R. Knowles
Trinidad	Russell R. Brown
Walsenburg	S. M. Andrews
Connecticut	
Ansonia	R. T. Tobin
Bridgeport	Worcester Warren
Bristol	Karl A. Reiche
Danbury	Harold F. Dow
Darien	Edward H. Fuller
Derby	Frank M. Buckley
E. Hartford	P. S. Barnes
E. Haven	W. E. Gillis
Enfield	E. H. Parkman
Fairfield	W. E. Smith
Glastonbury	Francis S. Knox
Greenwich	Edwin C. Andrews
Griswold	Chester L. Howe
Hamden	Margaret L. Keefe
Hartford	Fred D. Wish, Jr.
Killingly	W. E. Parker
Manchester	Fred A. Verplanck (Ninth District) A. F. Howes (Town Schools)
Meriden	C. C. Thompson
Middletown	Fred W. Shearer
Middletown (twn)	Van Buren Moody
Milford	C. W. Maddocks
Naugatuck	H. E. Chittenden
New Britain	S. H. Holmes
New Haven	Claude Russell
New London	Warren A. Hanson
Norwalk	John Lund
Norwich	E. J. Graham
Plainfield	J. L. Chapman
Plainville	Leon C. Staples
Plymouth	H. S. Fisher
Putnam	....
Seymour	R. C. Clark
Shelton	Harry E. Fowler
Southington	H. S. Libby
Stafford	Francis S. Brick
Stamford	J. A. Ewart
Stratford	E. Ward Ireland
Torrington	G. J. Vogel
Vernon	H. O. Clough
Wallingford	H. M. Jeffords
Waterbury	M. C. Donovan
Watertown	G. C. Swift
West Hartford	Lloyd H. Bugbee
West Haven	....
Westport	Mark R. Leffer
Wethersfield	Wilson Greer
Winchester	L. R. McKusick
Windham	Egbert A. Case
Windsor	Daniel Howard
Delaware	
Wilmington	S. M. Stouffer
District of Columbia	
Washington	Frank W. Ballou
Florida	
Bartow	T. T. Hatton (a)
Bradenton	B. D. Gullett (a)
Clearwater	....
Coral Gables	....
Daytona Beach	G. W. Marks (a)
Deland	G. W. Marks (a)
Fort Lauderdale	....
Fort Myers	J. C. English (a)
Gainesville	E. R. Simmons (a)
Jacksonville	R. B. Rutherford (a)
Key West	M. E. Russell (a)
Lakeland	T. T. Hatton (a)
Lake Worth	....
Miami	Charles M. Fisher (a)
Miami Beach	....
Ocala	Mrs. I. T. Sprinkle (a)
Orlando	A. B. Johnson (a)
Palatka	C. H. Price (a)
Panama City	....
Pensacola	William Tyler (a)
Plant City	W. D. F. Snipes (a)
River Junction	....
St. Augustine	C. G. Oldfather (a)
St. Petersburg	G. M. Lynch (a)
Sanford	T. W. Lawton (a)
Sarasota	....
South Jacksonville	R. B. Rutherford (a)
Tallahassee	F. S. Hartsfield (a)
Tampa	W. D. F. Snipes (a)
West Palm Beach	J. A. Youngblood (a)
Winter Haven	....
Georgia	
Albany	R. E. Brooks
Americus	J. E. Mathis
Athens	B. M. Grier
Atlanta	W. A. Sutton
Augusta	L. B. Evans
Bainbridge	E. G. Elcan
Brunswick	R. D. Eadie
Carrollton	W. Fred Gunn
Cartersville	H. B. Robertson
Cedartown	J. E. Purks
Columbus	R. B. Daniel
Cordele	D. H. Standard
Dalton	W. C. Jones
Decatur	Lamar Ferguson
Dublin	A. J. Hargrove
East Point	C. W. Reid
Fitzgerald	W. W. Stancil
Gainesville	W. P. Martin
Griffin	L. M. Lester
Lagrange	F. F. Rowe
Macon	W. P. Jones
Marietta	C. A. Keith
Milledgeville	G. S. Roach
Moultrie	J. L. Yaden
Newnan	C. B. Mathews
Rome	B. F. Quigg
Savannah	O. B. Strong
Thomasville	B. B. Broughton
Valdosta	A. G. Cleveland
Waycross	Ralph Newton
Idaho	
Boise	C. F. Dienst
Coeur d'Alene	J. J. Rae
Idaho Falls	R. H. Snyder
Lewiston	Glenn W. Todd
Nampa	J. E. Walsh
Pocatello	J. M. McDonald
Twin Falls	W. B. Smith
Illinois	
Alton	W. R. Curtis
Aurora	K. D. Waldo (East Side) J. H. Smith (West Side)
Batavia	H. C. Storm
Beardstown	W. L. Gard
Belleville	H. V. Calhoun
Belvidere	R. E. Garrett
Benton	M. J. Carlton
Berwyn	William Hawkes (Dist. No. 98) E. W. Martin (Dist. No. 100)
Bloomington	S. K. McDowell
Blue Island	J. E. Lemon
Brookfield	E. C. Cassady
Cairo	J. W. Carrington
Calumet City	J. A. Wieland
Canton	R. W. Hyndman
Carbondale	A. R. Boone
Centralia	R. V. Jordon
Champaign	U. L. Nickell
Charleston	U. B. Jeffries
Chicago	William J. Bogan
Chicago Heights	F. T. Goodier
Cicero	G. A. Schwebel
Clinton	Arthur Verner
Collinsville	C. H. Dorris
Danville	C. E. Vance
Decatur	William Harris
De Kalb	F. N. Phillips
Des Plaines	E. R. Selleck
Dixon	I. B. Potter
Downers Grove	George De Wolfe
Duquoin	Joe Strickler
East Moline	D. B. Hoffman
East Peoria	....
East St. Louis	D. Walter Potts
Edwardsville	Charles F. Ford
Elgin	Theodore Saam
Elmhurst	V. L. Beggs
Elmwood Park	....
Evanston	J. R. Skiles (Dist. No. 75) F. W. Nichols (Dist. No. 76)
Forest Park	W. S. Dimmett
Freeport	B. F. Shafer
Galesburg	O. O. Young
Gillespie	J. Bruce Ogg
Glencoe	Arthur B. Lowell
Glen Ellyn	S. A. Denison
Granite City	L. P. Frohardt
Harrisburg	Roscoe Pullian
Harvey	W. W. Meyer
Herrin	John R. Creek
Highland Park	Jesse L. Smith (Dist. No. 107) Clark G. Wright (Dist. No. 108)
Hinsdale	A. F. Cook
Hoopeston	W. R. Lowery
Jacksonville	Ralph Yakel
Johnston City	Earl E. Miller
Joliet	H. Ambrose Perrin
Kankakee	A. P. Johnson
Kewanee	Charles Bruner
La Grange	J. C. Davies
Lake Forest	J. E. Baggett
La Salle	J. B. McManus
Lawrenceville	M. N. Todd
Lincoln	D. F. Nichols
Litchfield	Allen J. Black
Lombard	....
Macomb	G. A. Selters
Madison	E. W. Heob
Marion	H. O. Belford
Mattoon	H. B. Black
Maywood	Eugene La Rowe
Melrose Park	Eugene La Rowe
Metropolis	C. J. Ramsay
Moline	L. A. Mahoney
Monmouth	Roy Fetherston
Morris	B. R. Bowden
Mount Carmel	R. S. Condrey
Mount Vernon	William Miner
Murphysboro	Sidna Mullineaux
Naperville	R. E. Beebe
Niles Center	....
Normal	Monroe Melton
North Chicago	R. L. Newenham
Oak Park	W. J. Hamilton
Olney	H. W. Hostettler
Ottawa	C. J. Byrne
Pana	J. L. Hart
Paris	John R. Moss
Park Ridge	Ruth Jane Brown
Pekin	C. B. Smith
Peoria	E. C. Fisher
Peru	A. H. Karn
Pontiac	A. F. Speltz
Quincy	J. H. Steiner
River Forest	Anna L. Shinn
Riverside	A. F. Ames
Rockford	Frank A. Jensen
Rock Island	J. J. Hagan
St. Charles	G. E. Thompson
Savanna	Ivan I. Meyer
Springfield	Frank T. Vasey
Spring Valley	C. L. Sarver
Sterling	H. U. Challand (Dist. No. 10) O. A. Fackler (Dist. No. 11)
Streator	H. B. Fisher
Summit	T. H. Pease
Taylorville	G. W. Wilcockson
Urbana	T. H. Cobb
Venice	Z. R. Wall
Villa Park	....
Waukegan	John S. Clark
West Frankfort	C. A. Waller
Wheaton	K. K. Tibbetts
Wilmette	J. R. Harper
Winnetka	C. W. Washburne
Wood River	G. A. Smith
Woodstock	W. J. Calahan
Zion	J. L. Bishop
Indiana	
Anderson	W. A. Denny
Auburn	H. L. McKenney
Bedford	M. J. Abbett

City	Superintendent
Bicknell	Harold Axe
Bloomington	R. N. Tirey
Bluffton	O. M. Craig
Brazil	C. P. Keller
Clinton	G. W. McReynolds
Columbus	Donald Du Shane
Connersville	E. C. Dodson
Crawfordsville	M. C. Darnall
Decatur	M. F. Warthman
East Chicago	J. R. Rossman
Elkhart	J. F. Wiley
Elwood	William F. Smith
Evansville	J. O. Chewning
Fort Wayne	L. C. Ward
Frankfort	J. W. Stott
Franklin	Arthur Campbell
Gary	William A. Wirt
Goshen	J. W. Foreman
Greensburg	Elmer C. Jerman
Hammond	L. L. Caldwell
Hartford City	H. Paul Kelsay
Hobart	Guy Dickey
Huntington	Jesse M. Scudder
Indianapolis	Paul C. Stetson
Jeffersonville	E. G. McCullum
Kendallville	H. M. Dixon
Kokomo	C. V. Haworth
Lafayette	A. E. Highley
La Porte	E. B. Wetherow
Lebanon	Paul Van Riper
Linton	T. J. Beecher
Logansport	D. W. Horton
Madison	E. O. Muncie
Marion	Elbert E. Day
Michigan City	Milo C. Murray
Mishawaka	P. C. Emmons
Mount Vernon	M. N. O'Bannon
Muncie	Frank E. Allen
New Albany	H. A. Buerk
New Castle	E. J. Llewelyn
Peru	G. W. Youngblood
Plymouth	Ray Kuhn
Portland	J. C. Webb
Princeton	G. E. Derbyshire
Richmond	W. G. Bate
Rushville	L. A. Lockwood
Seymour	N. J. Lasher
Shelbyville	William F. Vogel
South Bend	W. W. Borden
Sullivan	Dale C. Billman
Terre Haute	George C. Carroll
Valparaiso	Roy B. Julian
Vincennes	V. L. Eikenberry
Wabash	O. J. Neighbours
Warsaw	James M. Leffel
Washington	J. H. Shipp
West Lafayette	F. A. Burtsfield
Whiting	J. H. Hoskinson
Iowa	
Ames	M. G. Davis
Atlantic	J. P. Street
Boone	G. S. Wooten
Burlington	W. G. Brooks
Cedar Falls	F. L. Mahannah
Cedar Rapids	Arthur Deamer
Centerville	E. W. Fannon
Chariton	J. R. Cougill
Charles City	P. C. Lapham
Cherokee	N. D. McCombs
Clinton	C. W. Brown
Council Bluffs	J. A. True
Creston	G. E. De Wolf
Davenport	Frank L. Smart
Des Moines	J. W. Studebaker
Dubuque	E. D. Cline
Fairfield	W. G. Pence
Fort Dodge	K. D. Miller
Fort Madison	A. I. Tiss
Iowa City	I. A. Opstad
Keokuk	R. L. Reid
Marshalltown	W. F. Shirley
Mason City	R. B. Irons
Muscatine	E. A. Sparling
Newton	B. C. Berg
Oelwein	G. B. Ferrell
Oskaloosa	R. B. Newman
Ottumwa	Roy F. Hannum
Perry	Agnes E. Heightshoe
Red Oak	J. R. Inman
Shenandoah	W. Dean McKee
Sioux City	L. W. Feik
Spencer	Burton R. Jones
Waterloo	Charles W. Kline (East Side)
	Charles A. Kittrell (West Side)
Webster City	Burrus E. Beard
Kansas	
Abilene	F. C. Gardner
Arkansas City	C. E. St. John
Atchison	W. D. Wolfe
Chanute	L. H. Petit
Coffeyville	A. I. Decker
Concordia	E. B. Allbaugh
Dodge City	W. M. Richards
Eldorado	J. F. Hughes
Emporia	L. A. Lowther
Fort Scott	V. M. Liston
Garden City	Ira O. Scott
Great Bend	J. W. Murphy
Hutchinson	J. W. Gowans
Independence	J. H. Clement
Iola	A. M. Thoroman
Junction City	E. L. Novotny
Kansas City	M. E. Pearson
Lawrence	W. W. Curfman
Leavenworth	I. J. Bright
Liberal	N. B. Mahuron
Manhattan	W. E. Sheffer
McPherson	R. W. Potwin
Newton	J. B. Heffelfinger
Ottawa	A. F. Senter
Parsons	R. E. Hughes
Pittsburg	M. M. Rose
Pratt	W. A. Wood
Salina	W. S. Heusner
Topeka	A. J. Stout
Wellington	A. M. McCullough
Wichita	L. W. Mayberry
Winfield	W. W. McConnell
Kentucky	
Ashland	J. D. Falls
Bellevue	L. F. Gilligan
Bowling Green	T. C. Cherry
Catlettsburg	J. T. Miracle
Corbin	G. W. Campbell
Covington	G. O. Swing
Danville	L. C. Bosley
Dayton	Olin W. Davis
Fort Thomas	D. W. Bridges
Frankfort	J. W. Ireland
Glasgow	R. A. Palmore
Hazard	R. T. Whittinghill
Henderson	C. E. Dudley
Hopkinsville	Arkley Wright
Jenkins	C. V. Snapp
Lexington	Henry H. Hill
Louisville	L. R. Gregory
Ludlow	J. W. Smith
Madisonville	Harper Gatton
Mayfield	K. R. Patterson
Maysville	John Shaw
Middlesboro	J. W. Bradner
Newport	A. D. Owens
Owensboro	J. L. Foust
Paducah	L. J. Hanifan
Paris	Lee Kirkpatrick
Richmond	W. F. O'Donnell
Somerset	P. H. Hopkins
Winchester	E. F. Birckhead
Louisiana	
Alexandria	W. J. Avery (b)
Bastrop	E. D. Shaw (b)
Baton Rouge	W. B. Hatcher (b)
Bogalusa	M. O. Rudolph
Crowley	J. M. Baker (b)
Gretna	J. C. Ellis (b)
Hammond	C. C. Pittman (b)
Houma	H. L. Bourgeois (b)
Lafayette	J. W. Faulk (b)
Lake Charles	Ward Anderson
Minden	E. S. Richardson (b)
Monroe	E. L. Neville
Morgan City	L. A. Law (b)
New Iberia	L. G. Porter (b)
New Orleans	Nicholas Bauer (b)
Opelousas	W. B. Prescott (b)
Plaquemine	L. P. Terrebonne (b)
Shreveport	E. W. Jones (b)
West Monroe	T. O. Brown (b)
Maine	
Auburn	G. R. Gardner
Augusta	F. W. Burrill
Bangor	I. W. Small
Bath	C. D. Wilson
Biddeford	C. A. Weed
Brewer	H. R. Houston
Brunswick	Sherman Graves
Calais	F. C. English
Caribou	G. M. Carter
Gardiner	A. R. Carter
Houlton	George Cumming
Lewiston	C. W. Bickford
Millinocket	W. M. Marr
Oldtown	W. O. Chase
Portland	W. B. Jack
Rockland	E. L. Toner
Rumford	L. E. Williams
Saco	H. C. Hull
Sanford	J. A. Hamlin
Skowhegan	W. B. Woodbury
South Portland	L. W. Gerrish
Waterville	C. E. Glover
Westbrook	Guy Sinclair
Maryland	
Annapolis	George Fox (a)
Baltimore	D. E. Weglein
Cambridge	J. B. Noble (a)
Cumberland	C. L. Kopp (a)
Frederick	G. L. Palmer (a)
Frostburg	C. L. Kopp (a)
Hagerstown	B. J. Grimes (a)
Salisbury	J. M. Bennett (a)
Tacoma Park	Edwin W. Broome (a)
Massachusetts	
Abington	C. A. Record
Adams	R. A. Smith
Agawam	B. J. Phelps
Amesbury	R. R. Barr
Amherst	J. O. Cook
Andover	H. C. Sanborn
Arlington	C. A. Moody
Athol	W. S. Ward
Attleboro	L. A. Fales
Auburn	C. M. Harris
Barnstable	C. E. Wheeler
Belmont	F. A. Scott
Beverly	S. H. Chace
Billerica	E. C. Vining
Boston	J. E. Burke
Braintree	C. E. Fisher
Bridgewater	C. C. Putney
Brockton	J. F. Scully
Brookline	O. C. Gallagher
Cambridge	M. E. Fitzgerald
Canton	A. S. Ames
Chelmsford	G. S. Wright
Chelsea	G. C. Francis
Chicopee	J. J. Desmond, Jr.
Clinton	T. F. Gibbons
Concord	W. A. Hall
Danvers	I. G. Smith
Dartmouth	A. R. Paull
Dedham	J. C. Anthony
Dracut	C. L. Randall
Easthampton	H. D. Casey
Easton	G. C. Mann
Everett	Fairfield Whitney
Fairhaven	C. F. Prior
Fall River	H. L. Belisle
Fitchburg	J. M. McNamara
Framingham	B. J. Merriam
Franklin	A. W. Hale
Gardner	F. T. Reynolds
Gloucester	E. W. Fellows
Grafton	A. S. Cole
Great Barrington	R. H. Bellows
Greenfield	F. W. Porter
Haverhill	A. L. Barbour
Hingham	O. K. Collins
Holyoke	W. R. Peck
Hudson	B. D. Brown
Ipswich	J. I. Horton
Lawrence	B. M. Sheridan
Leominster	W. H. Perry
Lexington	T. S. Grindle
Lowell	H. J. Molloy
Ludlow	R. D. Tucker
Lynn	H. S. Gruver
Malden	F. G. Marshall

City	Superintendent
Mansfield	L. L. Woods
Marblehead	F. H. Hill
Marlboro	E. P. Carr
Maynard	C. H. Walker
Medford	J. S. Kadesch
Melrose	H. H. Stuart
Methuen	L. H. Conant
Middleboro	J. S. Cushing
Milford	A. O. Caswell
Millbury	C. C. Ferguson
Milton	H. F. Turner
Montague	J. S. Keating
Natick	C. R. Hall
Needham	J. C. Davis
New Bedford	A. P. Keith
Newburyport	S. M. King
Newton	U. G. Wheeler
North Adams	G. C. Bowman
Northampton	F. K. Congdon
North Andover	F. E. Pitkin
North Attleboro	G. W. Morris
Northbridge	H. J. Phipps
Norwood	L. W. Grant
Orange	E. C. Hempel
Palmer	C. H. Hobson
Peabody	Thos. W. Sheehan
Pittsfield	J. F. Gannon
Plymouth	A. B. Handy
Quincy	J. N. Muir
Randolph	A. O. Christiansen
Reading	A. L. Safford
Revere	C. F. Lindstol
Rockland	R. S. Esten
Salem	G. M. Bemis
Saugus	J. W. Lambert
Shrewsbury	M. A. Sturtevant
Somerville	E. W. Ireland
Southbridge	F. E. Corbin
South Hadley	F. E. Whittemore
Spencer	I. H. Agard
Springfield	Z. E. Scott
Stoneham	C. E. Varney
Stoughton	Warren B. Lyman
Swampscott	Frank L. Mansur
Taunton	W. A. Mowry
Tewksbury	S. G. Bean
Uxbridge	A. B. Garcelon
Wakefield	W. B. Atwell
Walpole	....
Waltham	W. H. Slayton
Ware	W. R. Barry
Wareham	Bion C. Merry
Watertown	W. H. Price
Webster	J. A. Lobban
Wellesley	S. M. Graves
Westboro	J. H. Armstrong
Westfield	C. D. Stiles
West Springfield	J. R. Fausey
Weymouth	P. T. Pearson
Whitman	F. E. Holt
Winchendon	G. W. Vail
Winchester	J. J. Quinn
Winthrop	E. R. Clarke
Woburn	G. I. Clapp
Worcester	W. S. Young
Michigan	
Adrian	C. H. Grifley
Albion	Don Harrington
Alma	F. R. Phillips
Alpena	George H. Curtis
Ann Arbor	O. W. Haisley
Battle Creek	W. G. Coburn
Bay City	G. L. Jenner
Benton Harbor	S. C. Mitchell
Berkeley	R. B. French
Birmingham	C. L. Vliet
Cadillac	B. C. Shankland
Charlotte	E. H. Chapelle
Coldwater	J. T. Symons
Dearborn	Ray H. Adams
Detroit	Frank Cody
Dowagiac	C. M. Horn
East Detroit	John Kantner
Ecorse	C. J. Miller
Escanaba	R. E. Cheney
Ferndale	E. F. Down
Flint	L. H. Lamb
Gladstone	A. R. Watson
Grand Haven	E. H. Babcock
Grand Rapids	L. A. Butler
Grosse Point	S. M. Brownell
Grosse Point Park	....
Hamtramck	M. R. Keyworth
Hancock	Leonard M. Niece
Hastings	D. A. Van Buskirk
Highland Park	I. M. Allen
Hillsdale	L. P. Holliday
Holland	E. E. Fell
Ionia	A. A. Rather
Iron Mountain	M. B. Travis
Ironwood	Du Fay R. Rice
Ishpeming	C. L. Phelps
Jackson	Harold Steele
Kalamazoo	E. H. Drake
Kingsford	Frank C. Sweeney
Lansing	J. W. Sexton
Lapeer	E. E. Irwin
Lincoln Park	Leo W. Huff
Ludington	H. E. Waits
Manistee	Benj. Klager
Manistique	A. F. Hall
Marquette	W. M. Whitman
Marshall	H. W. Holmes
Menominee	J. L. Silvernale
Midland	J. J. Schafer
Monroe	C. W. Crandell
Mount Clemens	L. W. Fast
Mount Pleasant	G. E. Ganiard
Muskegon	John A. Craig
Muskegon Heights	W. R. Booker
Negaunee	H. S. Doolittle
Niles	F. W. Crawford
Owosso	E. J. Willman
Petoskey	H. C. Spitler
Pontiac	James H. Harris
Port Huron	L. A. Packard
River Rouge	A. McDonald
Roseville	A. A. Neverth
Royal Oak	Frank Hendry
Saginaw	C. F. Miller
St. Clair Shores	T. V. Eddy
St. Joseph	E. P. Clarke
Sault Ste. Marie	G. G. Malcolm
Sturgis	C. M. Ferner
Three Rivers	C. H. Carrick
Traverse City	C. L. Poor
Ypsilanti	A. G. Erickson
Minnesota	
Albert Lea	A. L. Gaarder
Austin	S. T. Neveln
Bemidji	J. W. Smith
Brainerd	W. C. Cobb
Chisholm	J. P. Vaughan
Cloquet	E. B. Anderson
Columbia Heights	H. C. Nelson
Crookston	Arnold Gloor
Duluth	Leonard Young
Ely	W. E. Englund
Eveleth	Daniel B. Heller
Fairmont	R. H. Towne
Faribault	H. H. Kirk
Fergus Falls	Alvin T. Stolen
Hastings	E. A. Durbahn
Hibbing	J. W. Richardson
International Falls	Harold R. Peterson
Little Falls	E. C. Van Dusen
Mankato	J. E. Anderson
Minneapolis	C. R. Reed
Moorhead	S. G. Reinertsen
New Ulm	F. B. Andreen
Owatonna	John J. Skinner
Red Wing	G. V. Kinney
Rochester	G. H. Sanberg
St. Cloud	H. B. Gough
St. Paul	S. O. Hartwell
South St. Paul	Irvin T. Simley
Stillwater	Guy D. Smith
Virginia	R. H. Brown
Willmar	A. M. Wisness
Winona	D. F. Dickerson
Mississippi	
Biloxi	A. L. May
Brookhaven	Edgar S. Bowlus
Clarksdale	H. B. Heidelberg
Columbus	C. N. Brandon
Corinth	Hal Anderson
Greenville	E. E. Bass
Greenwood	W. C. Williams
Gulfport	B. Frank Brown
Hattiesburg	W. I. Thames
Jackson	Edward L. Bailey
Laurel	R. H. Watkins
McComb	Joseph E. Gibson
Meridian	H. M. Ivy
Natchez	W. H. Braden
Tupelo	Charles F. Capps
Vicksburg	H. V. Cooper
Yazoo City	R. L. Bedwell
Missouri	
Boonville	L. E. Ziegler
Brookfield	L. V. Crookshank
Cape Girardeau	J. A. Whiteford
Carthage	J. L. Campbell
Chillicothe	G. E. Dille
Clayton	W. I. Oliver
Clinton	Arthur Lee
Columbia	John L. Bracken
De Soto	O. T. Coil
Fulton	J. T. Bush
Hannibal	L. McCartney
Independence	E. B. Street
Jefferson City	William F. Knox
Joplin	E. A. Elliott
Kansas City	George Melcher
Kirksville	J. H. Neville
Kirkwood	F. P. Tillman
Maplewood	J. Richmond
Marshall	W. M. Westbrook
Maryville	J. L. Lawing
Mexico	L. H. Hawthorne
Moberly	M. F. Beach
Nevada	Wade Fowler
Poplar Bluff	G. F. Loughead
Richmond Heights	P. L. Collier
St. Charles	Stephen Blackhurst
St. Joseph	F. H. Barbee
St. Louis	Henry J. Gerling
Sedalia	Heber U. Hunt
Sikeston	Roy V. Ellise
Springfield	Harry P. Study
Trenton	W. H. McDonald
University City	Charles Banks
Warrensburg	Edward Beatty
Washington	C. J. Burger
Webb City	D. R. McDonald
Webster Groves	W. E. Goslin
Montana	
Anaconda	W. K. Dwyer
Billings	A. T. Peterson
Bozeman	D. S. Williams
Butte	J. G. Ragsdale
Great Falls	Irving W. Smith
Havre	W. J. Shirley
Helena	R. O. Evans
Kalispell	W. D. Swetland
Lewistown	C. G. Manning
Livingston	B. A. Winans
Miles City	Glen G. Eye
Missoula	Charles D. Haynes
Nebraska	
Alliance	H. G. Partridge
Beatrice	A. L. Burnham
Columbus	R. R. McGee
Fairbury	W. E. Scott
Falls City	A. B. Gelwick
Fremont	A. H. Waterhouse
Grand Island	C. Ray Gates
Hastings	A. H. Staley
Kearney	O. A. Wirsig
Lincoln	M. C. Lefler
McCook	J. C. Mitchell
Nebraska City	G. G. Warren
Norfolk	H. B. Simon
North Platte	W. J. Braham
Omaha	J. H. Beveridge
Scottsbluff	E. L. Weaver
York	Conrad Jacobson
Nevada	
Las Vegas	Maude Frazier
Reno	B. D. Billinghurst
New Hampshire	
Berlin	Frank C. Ketler
Claremont	A. B. Kellogg

City	Superintendent
Concord	L. J. Rundlett
Derry	Carl Cotton
Dover	J. E. Wignot
Franklin	Fred S. Libbey
Keene	W. E. Hammond
Laconia	John S. Gilman
Lebanon	W. J. English
Manchester	L. P. Benezet
Nashua	Earle T. Tracey
Portsmouth	Harry L. Moore
Rochester	William H. Buker
Somersworth	H. L. Winslow
New Jersey	
Asbury Park	A. E. Kraybill
Atlantic City	C. B. Boyer
Audubon	William L. Fidler
Bayonne	Preston H. Smith
Belleville	G. R. Gerard
Bergenfield	Roy W. Brown
Bloomfield	Edgar S. Stover
Bogota	Frank E. Tilton
Boonton	M. B. Mann
Bound Brook	Albert S. Davis
Bridgeton	Chester Robbins
Burlington	Vann H. Smith
Caldwell	D. C. Barnett
Camden	James E. Bryan
Carlstadt	George Kintner
Carteret	Barbara V. Hermann
Cliffside Park	George F. Hall
Clifton	George J. Smith
Collingswood	John B. Ritter
Cranford	Sarah Edmond
Dover	R. S. Bowlby
Dumont	L. J. Honiss
Dunellen	R. W. Crane
East Orange	C. J. Scott
East Rutherford	Frank J. Oglee
Elizabeth	Ira T. Chapman
Englewood	Winton J. White
Fairview	Z. G. Masten, Jr.
Fort Lee	Arthur E. Chase
Freehold	Lloyd S. Cassel
Garfield	W. H. Steegar
Glen Ridge	H. W. Dutch
Gloucester	J. C. Groome
Guttenburg	Mrs. Anna L. Klein
Hackensack	William A. Smith
Haddonfield	Allen S. Martin
Haddon Heights	William C. Davis
Hammonton	H. H. Smith
Harrison	C. A. McGlennon
Hasbrouck H'ghts	C. C. Hitchcock
Hawthorne	F. H. Thoms
Highland Park	F. Willard Furth
Hillside	A. G. Woodfield
Hoboken	Daniel S. Kealey
Irvington	Robert L. Saunders
Jersey City	James A. Nugent
Kearny	Herman Dressel
Leonia	Nelson C. Smith
Linden	D. A. Howell
Lodi	Henry V. Matthews
Long Branch	Charles T. Stone
Lyndhurst	R. D. Batten
Madison	Harry A. Wann
Manville	B. J. Boyer
Metuchen	Carl H. Galloway
Montclair	Frank G. Pickell
Morristown	J. Burton Wiley
Neptune Towns'p	....
Newark	John H. Logan
New Brunswick	F. J. Sickles
Newton	C. H. Reagle
North Arlington	Louis D. Carr
North Bergen	M. F. Husted
Nutley	Paul C. Radcliffe
Ocean City	Albert C. Shuck
Orange	W. B. Patrick
Palisades Park	Carl A. Marsden
Paterson	John R. Wilson
Paulsboro	Wilmer F. Burns
Pensauken Twp.	George B. Fine
Phillipsburg	Frank D. Munroe
Plainfield	F. W. Cook
Princeton	Mabel T. Vanderbilt
Prospect Park	Thomas L. Bump
Rahway	W. F. Little
Red Bank	Edwin C. Gilland
Ridgefield	Charles Dixon
Ridgewood	Ira W. Travell
Roselle	John R. Patterson
Roselle Park	E. F. Smith
Rutherford	C. A. Fetterly
Salem	A. J. Dohner
Sayreville	Jene Selover
Secaucus	M. J. Pechtel
Somerville	T. Latimer Brooks
South Amboy	Oscar O. Barr
South Orange	John H. Bosshart
South Plainfield	Harry C. Fries
South River	William S. Lesh
Summit	John B. Dougall
Teaneck	Lester N. Neulen
Tenafly	Ralph S. Maugham
Trenton	William J. Bickett
Union City	Arthur O. Smith
Union Twp.	Edward F. Waldron
Ventnor	H. R. Jackson
Verona	F. N. Brown
Vineland	H. W. Weidner
Wallington	E. A. Harding
Weehawken	R. E. Pinkham
Westfield	C. A. Philhower
West New York	H. L. Bain
West Orange	S. C. Strong
Woodridge	Benjamin E. Farr
New Mexico	
Albuquerque	John Milne
Clovis	J. M. Bickley
Gallup	C. B. Redick
Las Cruces	L. M. Cook
Raton	D. W. MacKay
Roswell	D. N. Pope
Santa Fe	Isabel L. Eckles
New York	
Albany	C. Edward Jones
Amsterdam	Wilbur H. Lynch
Auburn	George F. Barford
Batavia	Clyde P. Wells
Beacon	E. D. Hewes
Binghamton	Daniel J. Kelly
Bronxville	Willard W. Beatty
Buffalo	E. C. Hartwell
Canadaigua	Frank E. Fisk
Catskill	J. T. Kaemmerlin
Cohoes	Edward Hayward
Corning	William E. Severn (Dist. No. 9) A. M. Blodgett (Dist. No. 13)
Cortland	F. E. Smith
Depew	J. M. Barker
Dobbs Ferry	J. A. McGinness
Dunkirk	F. K. Darling
East Rochester	B. H. Root
Elmira	H. O. Hutchinson
Elmira Heights	L. N. Freeman
Endicott	Herbert H. Crumb
Floral Park	....
Fredonia	Claude R. Dye
Freeport	John W. Dodd
Fulton	George R. Bodley
Garden City	Winfield A. Townsend
Geneva	W. L. Houseman
Glen Cove	H. H. Chapman
Glens Falls	A. W. Miller
Gloversville	H. W. Langworthy
Hastings-on-Hudson	John L. Hopkins
Haverstraw	A. P. Burroughs
Hempstead	T. P. Calkins
Herkimer	Loraine W. Bills
Hornell	Harrison S. Dodge
Hudson	M. C. Smith
Hudson Falls	David R. Finley
Ilion	Earl P. Watkin
Ithaca	C. L. Kulp
Jamestown	Milton J. Fletcher
Johnson City	H. B. Eccleston
Johnstown	E. L. Ackley
Kenmore	F. C. Densberger
Kingston	M. J. Michael
Lackawanna	William J. Breen
Lancaster	Frank L. Smith
Little Falls	F. R. Wegner
Lockport	R. B. Kelley
Long Beach	Walter J. Schwalje
Lynbrook	C. D. Vosburgh
Malone	Horace H. Lamberton
Mamaroneck	Arthur Z. Boothby
Massena	A. W. Fortune
Mechanicville	Evan E. Jones
Medina	H. E. Brown
Middletown	E. H. Burdick
Mineola	Harlan B. Allen
Mount Kisco	H. M. Jennings
Mount Vernon	William H. Holmes
Newark	F. Neff Stroup
Newburgh	Rosena N. Neely (c)
New Rochelle	Albert Leonard
New York	William J. O'Shea
Niagara Falls	James F. Taylor
North Tarrytown	C. A. Benedict
North Tonawanda	D. E. Batcheller
Norwich	F. R. Wassung
Nyack	A. C. Hamilton
Ogdensburg	Arthur J. Laidlaw
Olean	W. C. Greenawalt
Oneida	Albert H. Covell
Oneonta	George J. Dann
Ossining	Everett A. Barto
Oswego	Frederick Leighton
Patchogue	Sheridan Linn
Peekskill	Paul R. Spencer
Penn Yan	C. G. Hetherington
Plattsburg	G. M. Elmendorf
Port Chester	Alvah G. Frost
Port Jervis	A. H. Naylor
Poughkeepsie	Ward C. Moon
Rensselaer	Walter S. Clark
Rochester	Herbert S. Weet
Rockville Center	William S. Covert
Rome	George R. Staley
Rye	George E. Webster (Principal)
Salamanca	George A. Place
Saranac Lake	H. V. Littell
Saratoga Springs	Harris Crandall
Scarsdale	Ralph I. Underhill
Schenectady	W. H. Pillsbury
Scotia	B. W. Conrad
Seneca Falls	Hubert Mott
Solvay	Claude A. Duvall
Syracuse	G. Carl Alverson
Tarrytown	L. V. Case
Tonawanda	Walter S. Fraser
Troy	Neil K. White (Lansingburg Dist.) George H. Krug (Union District)
Tupper Lake	R. E. Minnich
Utica	John A. De Camp
Watertown	R. E. Burdick
Watervliet	William Richmond
Waverly	P. C. Meserve
Wellsville	George F. Jammer
Whitehall	Page E. Cole
White Plains	John W. Lumbard
Yonkers	Lamont F. Hodge
North Carolina	
Asheboro	R. J. Hilker
Asheville	W. L. Brooker
Burlington	C. C. Haworth
Canton	A. J. Hutchins
Charlotte	H. P. Harding
Concord	A. S. Webb
Durham	Frank M. Martin
Elizabeth City	J. A. Jones
Fayetteville	Harry Howell
Gastonia	W. P. Grier
Goldsboro	Ray Armstrong
Greensboro	Guy B. Phillips
Greenville	J. H. Rose
Henderson	E. M. Rollins
Hendersonville	A. W. Honeycutt
Hickory	R. W. Carver
High Point	T. Wingate Andrews
Kings Mountain	Claude Grigg
Kinston	W. A. Graham
Lenoir	C. S. Warren
Monroe	G. W. Bradshaw
Mooresville	H. C. Miller
Morganton	W. F. Starnes
Mount Airy	L. B. Pendergraph
New Bern	H. B. Smith
Raleigh	P. S. Daniel
Reidsville	Fred M. Arrowood
Rocky Mount	R. M. Wilson
Salisbury	E. J. Coltrane
Shelby	B. L. Smith

City	Superintendent
Statesville	R. M. Gray
Tarboro	W. A. Mahler
Thomasville	D. W. Maddox
Washington	H. M. Roland
Wilmington	O. A. Hamilton
Wilson	K. R. Curtis
Winston-Salem	R. H. Latham.
North Dakota	
Bismarck	H. O. Saxvik
Devils Lake	F. H. Gilliland
Dickinson	P. S. Berg
Fargo	J. G. Moore
Grand Forks	John C. West
Jamestown	C. L. Robertson
Mandan	J. C. Gould
Minot	L. A. White
Valley City	G. W. Hanna
Williston	J. N. Urness
Ohio	
Akron	Thomas W. Gosling
Alliance	B. F. Stanton
Ashland	E. L. Bowsher
Ashtabula	M. S. Mitchell
Barberton	U. L. Light
Bedford	A. E. Moody
Bellaire	J. V. Nelson
Bellefontaine	S. A. Frampton
Bellevue	C. M. Carrick
Berea	A. G. Yawberg
Bexley	H. C. Dietrich
Bowling Green	Arch B. Conklin
Bucyrus	E. N. Dietrich
Cambridge	Hugh R. Hick
Campbell	W. M. Coursen
Canton	Jesse H. Mason
Chillicothe	W. L. Miller
Cincinnati	Edward D. Roberts
Circleville	J. O. Eagleson
Cleveland	R. G. Jones
Cleveland H'ghts	Frank L. Wiley
Columbus	J. G. Collicott
Conneaut	C. M. Dickey
Coshocton	A. C. Pence
Cuyahoga Falls	W. H. Richardson
Dayton	C. V. Courter
Defiance	E. W. Howey
Delaware	R. D. Conrad
Delphos	E. W. Bell
Dover	S. O. Mose
East Cleveland	W. H. Kirk
East Liverpool	Herbert G. Means
East Palestine	C. E. Palmer
Elyria	R. C. Maston
Euclid	W. A. Franks
Findlay	I. F. Matteson
Fostoria	J. M. Reed
Fremont	C. A. Hudson
Galion	J. F. Bemiller
Gallipolis	Wayne Lutz
Garfield Heights	Glen D. King
Girard	E. O. Trescott
Grandview H'ghts (Columbus P. O.)	W. C. Rohleder
Greenville	C. L. Bailey
Hamilton	D. R. Baker
Ironton	Harper C. Pendry
Jackson	H. L. Bates
Kent	W. A. Walls
Kenton	D. B. Clark
Lakewood	Julius E. Warren
Lancaster	D. M. Hickson (c)
Lima	R. E. Offenhauer
Lockland	J. U. Dungan
Logan	G. E. Carr
Lorain	D. J. Boone
Mansfield	C. A. Waltz
Maple Heights (Bedford P. O.)	C. R. Dustin
Marietta	H. L. Sullivan
Marion	George A. Bowman
Martins Ferry	W. L. Kocher
Massillon	Harry R. Gorrell
Miamisburg	Harris V. Bear
Middletown	R. W. Solomon
Mingo Junction	F. C. Gilmour
Mount Vernon	A. W. Elliott
Nelsonville	H. E. Zuber
Newark	Oren J. Barnes
New Boston	D. E. Ross
New Philadelphia	F. P. Geiger
Niles	R. J. Kiefer
Norwalk	C. C. Patterson
Norwood	C. W. Johnson
Oakwood (Dayton P. O.)	A. E. Claggett
Painesville	C. C. Pierce
Parma	M. M. Berry
Piqua	G. C. Dietrich
Portsmouth	Frank Appel
Ravenna	O. E. Pore
Reading	H. A. Kellum
Rocky River	W. W. Andrew
St. Bernard	F. M. Reynolds
St. Marys	C. C. McBroom
Salem	John S. Alan
Sandusky	F. J. Prout
Shaker Heights	F. H. Bair
Shelby	R. I. Lewis
Sidney	C. C. Crawford
Springfield	F. M. Shelton
Steubenville	Robert L. Erwin
Struthers	H. S. Floyd
Tiffin	C. A. Krout
Toledo	Charles S. Meek
Toronto	S. C. Dennis
Troy	T. E. Hook
Uhrichsville	H. B. Galbraith
Urbana	C. W. Cookson
Van Wert	U. E. Diener
Wadsworth	Frank H. Close
Wapakoneta	M. R. Menschel
Warren	H. B. Turner
Washington Court House	A. D. St. Clair
Wellston	W. G. Scarberry
Wellsville	S. E. Daw
Wilmington	H. W. Hodson
Wooster	George C. Maurer
Xenia	L. F. Hammerle
Youngstown	J. J. Richeson
Zanesville	C. T. Prose
Oklahoma	
Ada	I. S. Hinshaw
Altus	M. L. Cotton
Alva	C. A. Parker
Anadarko	J. T. Riley
Ardmore	J. J. Godbey
Bartlesville	C. O. Haskell
Blackwell	A. J. Lovett
Bristow	E. H. Black
Chickasha	T. T. Montgomery
Clinton	George D. Hann
Cushing	J. E. Hickman
Duncan	Chester P. Davis
Durant	G. T. Stubbs
Elk City	A. M. Keeth
El Reno	H. E. Wrinkle
Enid	E. D. Price
Guthrie	W. A. Greene
Henryetta	Edwin O. Shaw
Holdenville	Lanson D. Mitchell
Hugo	A. D. Hanry
Lawton	B. C. Swinney
McAlester	M. J. Hale
Miami	Clyde H. O'Dell
Muskogee	C. K. Reiff
Norman	Elmer Capshaw
Oklahoma City	J. R. Barton
Okmulgee	J. R. Holmes
Pawhuska	J. O. Hall
Picher	Paul L. Heilman
Ponca City	W. W. Isle
Sand Springs	H. Clay Fisk
Sapulpa	W. M. Chambers
Seminole	....
Shawnee	H. G. Faust
Stillwater	John T. Hefley
Tulsa	Merle C. Prunty
Wewoka	....
Woodward	E. H. Homberger
Oregon	
Albany	G. E. Finnerty
Astoria	A. C. Hampton
Baker	Hugh Coleman
Bend	G. W. Ager
Corvallis	H. W. Adams
Eugene	H. R. Goold
Klamath Falls	J. P. Wells
La Grande	J. T. Longfellow
Marshfield	Lynn A. Parr
Medford	E. H. Hedrick
Oregon City	Roy W. Glass
Pendleton	Austin Landreth
Portland	Charles A. Rice
Salem	George W. Hug
The Dalles	C. W. Boetticher
Pennsylvania	
Abington	Edward S. Ling
Aliquippa	H. R. Vanderslice
Allentown	H. W. Dodd
Altoona	Robert E. Laramy
Ambridge	C. Herman Grose
Archbald	W. A. Kelly
Arnold	Donald P. Davis
Ashland	Edward W. Taylor
Ashley	John P. Gibbons
Avalon	S. Todd Perley
Bangor	O. W. Ackerman
Beaver	D. H. Stewart
Beaver Falls	Floyd Atwell
Bellevue	J. Nelson Mowls
Berwick	M. E. Houck
Bethlehem	W. H. Weiss
Blairsville	Berlin Empfield
Blakely Boro. (Address Peckville)	H. B. Anthony
Bloomsburg	C. H. Garwood
Brackenridge	Robert R. Anderson
Braddock	T. G. McCleary
Bradford	James F. Butterworth
Brentwood	J. D. Boydston
Bridgeport	Earl E. Smull
Bristol	Howard E. James
Butler	John A. Gibson
Canonsburg	F. W. McVay
Carbondale	James J. Crane
Carlisle	J. W. Potter
Carnegie	Norman L. Glasser
Centerville	C. H. Lyon
Chambersburg	U. L. Gordy
Charleroi	T. L. Pollock
Cheltenham twp. (Address Elkins Park)	Albert L. Rowland
Chester	David A. Ward
Clairton	H. D. Teal
Clearfield	George E. Zerfoss
Clifton Heights	William H. Brown
Coaldale	J. E. Gildea
Coatesville	Carl O. Benner
Collingdale	J. C. Carey
Columbia	J. B. Kennedy
Connellsville	Bela B. Smith
Conshohocken	Robert C. Landis
Coraopolis	J. C. Werner
Corry	Ralph S. Dewey
Crafton	E. O. Liggitt
Danville	E. B. Cline
Darby	W. R. Douthett
Dickson City	P. M. Brennan
Donora	Rex W. Dimmick
Dormont	Ralph Radcliffe
Du Bois	C. J. Alderfer
Dunmore	J. R. Gilligan
Dupont	Cecile T. Dugan
Duquesne	C. H. Wolford
Duryea	John J. Joyce
Easton	James C. Bay
East Pittsburgh	Charles F. Young
East Stroudsburg	Elmer E. Kuntz
Edwardsville	Victor E. Lewis
Ellwood City	W. Ray Smith
Emaus	H. J. Yeager
Erie	John C. Diehl
Etna	William M. Stewart
Exeter	John B. Campbell
Farrell	W. W. Irwin
Ford City	Quincey G. Vincent
Forest City	Jules J. Kerl
Forty Fort	F. A. Berkenstock
Frackville	W. R. Trautman
Franklin	C. E. Carter
Freeland	N. P. Luckenbill
Gettysburg	L. C. Keefauver
Glassport	John S. Hart
Greensburg	Thomas S. March
Greenville	G. B. Gerberich
Grove City	H. M. B. Lehn
Hanover	F. M. Haiston
Hanover twp.	....
Harrisburg	Martin H. Thomas

City	Superintendent
Harrison	M. G. Morris
Haverford	J. Frank Carter
Hazleton	A. D. Thomas
Hollidaysburg	C. V. Erdly
Homestead	Port Eckles
Honesdale	J. J. Koehler
Huntington	E. R. Barclay
Indiana	Norman C. Koontz
Jeanette	E. W. Long
Jersey Shore	Frank H. Painter
Johnstown	James Killius
Kane	R. D. Welch
Kingston	J. R. Merkel
Kittanning	Clyde W. Cranmer
Kulpmont	J. A. Shovlin
Lancaster	H. E. Gress
Lansdale	Ralph R. Smith
Lansdowne	Martha Anderson
Lansford	E. M. Balsbaugh
Larksville	Thomas F. Fenney
Latrobe	John G. Hulton
Lebanon	R. R. Abernethy
Lehighton	Bert B. David
Lewistown	Charles Coxe
Lock Haven	J. F. Puderbaugh
Lower Merion twp. (Address Ardmore)	S. Edgar Downs
Luzerne	Arthur E. Booth
Mahanoy City	H. A. Oday
McAdoo	Sallie L. Ferry
McKeesport	Joseph B. Richey
McKees Rocks	T. K. Johnston
Meadville	Warren P. Norton
Mechanicsburg	R. L. Van Scoten
Media	W. H. Michaels
Middletown	H. J. Wickey
Midland	H. V. Herlinger
Millvale	C. C. Williamson
Milton	Carl L. Millward
Minersville	C. E. Roudabush
Monessen	Samuel Fausold
Monongahela	John H. Dorr
Morrisville	M. R. Reiter
Mount Lebanon	Tressa Yeager
Mount Oliver	Minnie Ubinger
Mount Pleasant	J. C. Haberlen
Munhall	Charles R. Stone
Nanticoke	A. P. Diffendafer
Nanty-Glo	Harry E. Hogue
Nazareth	F. A. Marcks
New Brighton	S. W. Lyons
New Castle	Clyde C. Green
New Kensington	E. T. Chapman
Norristown	H. O. Dietrich
Northampton	G. A. Eichler
North Braddock	F. D. Zuerner
Oakmont	W. Lee Gilmore
Oil City	R. A. Baum
Old Forge	B. T. Harris
Olyphant	John A. Dempsey
Palmerton	J. N. Roeder
Parnassus	Joseph L. Black
Philadelphia	Edwin C. Broome
Pitcairn	C. C. Pearsall
Pittsburgh	Ben G. Graham
Pittston	D. J. Cray
Plains	....
Plymouth	H. S. Jones
Pottstown	F. Herman Fritz
Pottsville	L. A. BuDahn
Punxsutawney	F. S. Jackson
Rankin	Frank J. Good
Reading	Amanda E. Stout
Ridgway	W. M. Pierce
Rochester	D. M. Albright
St. Clair	Charles R. Birch
St. Marys	J. J. Lynch
Sayre	L. E. De Laney
Schuylkill Haven	C. S. Madeira
Scottdale	S. B. Bulick
Scranton	John H. Dyer
Sewickley	L. H. Conway
Shamokin	P. E. Whitmeyer
Sharon	W. D. Gamble
Sharpsburg	J. J. Donovan
Sharpsville	Harry E. Pebly
Shenandoah	A. J. Ratchford
South Brownsville	Charles A. Miller
South Williamsport	A. B. Elder
Steelton	Charles S. Davis
Stone	....
Stroudsburg	Robert Brown
Summit Hill	E. T. McCready
Sunbury	J. E. Shambach
Swissvale	C. C. Kelso
Swoyersville	Joseph H. Finn
Tamaqua	F. G. Horner
Tarentum	A. D. Endsley
Taylor	W. S. Robinson
Throop	John J. O'Hara
Titusville	G. A. Stetson
Turtle Creek	W. A. Rodgers
Tyrone	W. W. Eisenhart
Uniontown	Milton D. Proctor
Upper Darby	William C. Sampson
Vandergrift	Charles H. Omo
Warren	P. W. M. Pressel
Washington	Meyers B. Horner
Waynesboro	D. J. Keener
West Chester	Walter L. Philips
West Hazleton	Ernest Eucke
West Pittston	R. J. W. Templin
Westview	H. N. Hennon
West York	A. H. Martin
Wilkes-Barre	H. H. Zeiser
Wilkinsburg	W. C. Graham
Williamsport	A. M. Weaver
Wilmerding	Charles W. Shaffer
Wilson Boro... (Address Easton)	C. E. Furst
Windber	J. W. Hedge
Winton Boro.. (Address Jessup)	J. L. McCloskey
Yeadon	....
York	A. W. Ferguson
Rhode Island	
Barrington	Charles H. Keyes
Bristol	E. S. Mapes
Burrillville	J. C. Sweeney
Central Falls	James E. Martin
Coventry	R. E. E. Campbell
Cranston	John K. Fenner
Cumberland	Emma M. Caufield
East Providence	J. R. D. Oldham
Johnston	T. H. De Coudres
Lincoln	John L. Smith
Newport	Herbert W. Lull
North Providence	Harold T. Lowe
Pawtucket	William A. Newell
Providence	A. J. Stoddard
South Kingstown	E. K. Wilcox
Warren	Leroy G. Staples
Warwick	Warren A. Sherman
Westerly	Willard H. Bacon
West Warwick	John F. Deering
Woonsocket	James F. Rockett
South Carolina	
Aiken	....
Anderson	E. C. McCants
Camden	J. G. Richards, Jr.
Charleston	A. B. Rhett
Chester	Myron E. Brockman
Clinton	J. H. Witherspoon
Columbia	A. C. Flora
Darlington	J. C. Daniel
Florence	John W. Moore
Gaffney	W. E. Sawyer
Georgetown	W. C. Bynum
Greenville	J. L. Mann
Greenwood	W. E. Black
Hartsville	J. H. Thornwell
Laurens	C. K. Wright
Newberry	O. B. Cannon
Orangeburg	A. J. Thackson
Rock Hill	R. C. Burts
Spartanburg	Frank Evans
Sumter	S. H. Edmunds
Union	T. C. Jolly, Jr.
South Dakota	
Aberdeen	C. L. Dalthorp
Huron	Andrew J. Lang
Lead	R. V. Hunkins
Mitchell	John C. Lindsey
Rapid City	E. B. Bergquist
Sioux Falls	A. A. McDonald
Watertown	H. Mackenzie
Yankton	C. A. Beaver
Tennessee	
Alcoa	V. F. Goddard
Athens	J. C. Ridenour
Bristol	Ralph B. Rubins
Chattanooga	W. T. Robinson
Clarksville	C. H. Moore
Cleveland	R. T. Allen
Columbia	R. L. Harris
Dyersburg	C. M. Walker
Elizabethton	Ernest H. Cox
Greenville	S. T. Gass
Jackson	C. B. Ijams
Johnson City	C. E. Rogers
Kingsport	R. N. Robinson
Knoxville	H. P. Shepherd
Memphis	R. L. Jones
Morristown	Carl T. Vance
Murfreesboro	J. C. Mitchell
Nashville	H. F. Srygley
Paris	H. L. Smith
Shelbyville	O. E. Ratcliffe
Springfield	Wilbur S. Young
Union City	J. T. Webb
Texas	
Abilene	R. D. Green
Amarillo	W. A. McIntosh
Austin	A. N. McCallum
Beaumont	M. E. Moore
Big Spring	W. C. Blankenship
Bonham	W. T. White
Borger	Don Baker
Breckenridge	H. S. Holland
Brenham	M. B. Holleman
Brownsville	G. W. Gotke
Brownwood	E. J. Woodward
Bryan	Harry L. Durham
Childress	A. W. Adams
Cisco	R. N. Cluck
Cleburne	Emmett Brown
Coleman	C. H. Hufford
Corpus Christi	Mary Carroll
Corsicana	H. D. Fillers
Crystal City	S. H. Fly
Dallas	N. R. Crozier
Del Rio	Roy M. Andrews
Denison	F. B. Hughes
Denton	W. T. Doggett
Eagle Pass	B. H. Miller
Electra	B. M. Dinsmore
El Paso	A. H. Hughey
Ennis	Newton W. McCann
Fort Worth	M. H. Moore
Gainesville	H. O. McCain
Galveston	E. G. Littlejohn
Goose Creek	W. R. Smith
Greenville	L. C. Gee
Harlingen	Paul E. Phipps
Highland Park	H. E. Gable
Hillsboro	Loy W. Hartsfield
Houston	E. E. Oberholtzer
Huntsville	Charles N. Shaver
Jacksonville	Larue Cox
Kingsville	J. D. Bramlette
Laredo	W. P. Galligan
Longview	Henry L. Foster
Lubbock	M. H. Duncan
Lufkin	I. A. Coston
Luling	R. A. Box
Marlin	H. J. McIlhany
Marshal	E. C. Deering
McAllen	John H. Gregory
McKinney	Jack R. Ryan
Mercedes	Ernest H. Poteet
Mexia	J. C. Cochran
Midland	W. W. Lackey
Mineral Wells	R. H. Brannan
Mission	S. L. Hardin
Nacogdoches	Rufus E. Price
Navasota	L. G. Andrews
New Braunfels	E. A. Sahm
Orange	E. B. Stover
Palestine	Bonner Frizzell
Pampa	R. B. Fisher
Paris	A. H. Chamness
Plainview	Randolph L. Clark
Port Arthur	G. M. Simms
Ranger	R. F. Holloway
San Angelo	Felix E. Smith
San Antonio	B. W. Hartley
San Benito	Thomas J. Yoe

City	Superintendent
San Marcos	L. J. Berry
Seguin	Joe F. Saegert
Sherman	L. T. Cook
Sulphur Springs	W. L. Willis
Sweetwater	B. H. McLain
Taylor	R. H. Brister
Temple	L. C. Procter
Terrell	J. E. Langwith
Texarkana	H. W. Stilwell
Tyler	J. M. Hodges
Uvalde	Guy D. Dean
Vernon	W. T. Lofland
Victoria	V. L. Griffin
Waco	B. B. Cobb
Waxahachie	G. B. Winn
Wichita Falls	....
Yoakum	L. B. McGuffin
Utah	
Brigham	C. H. Skidmore(a)
Logan	Louis A. Petersen
Murray	E. Allen Bateman
Ogden	W. Karl Hopkins
Provo	Charles A. Smith
Salt Lake City	George N. Child
Tooele	P. M. Nielsen(a)
Vermont	
Barre	Carroll H. White
Bennington	D. W. McClelland
Brattleboro	Florence M. Wellman
Burlington	Lyman C. Hunt
Montpelier	W. A. Kincaid
Newport	E. A. Hamilton
Rockingham	F. M. Malcolm
Rutland	W. W. Fairchild
St. Albans	Josiah S. McCann
St. Johnsbury	S. C. Harding
Winooski	G. R. Stackpole
Virginia	
Alexandria	R. C. Bowton
Bluefield	A. S. Greever(d)
Bristol	Roy B. Bowers
Charlottesville	James G. Johnson
Clifton Forge	Herman Blankinship
Covington	J. G. Jeter(d)
Danville	G. L. H. Johnson
Fredericksburg	G. H. Brown
Hampton	Robert M. Newton
Harrisonburg	W. H. Keister
Hopewell	R. W. Copeland
Lynchburg	E. C. Glass
Martinsville	B. Clifford Goode(d)
Newport News	J. H. Saunders
Norfolk	C. W. Mason
Petersburg	Henry G. Ellis

City	Superintendent
Portsmouth	Harry A. Hunt
Pulaski	E. L. Darst(d)
Radford	W. K. Barnett
Richmond	Albert H. Hill
Roanoke	D. E. McQuilkin
South Norfolk	R. H. Pride
Staunton	L. F. Shelburne
Suffolk	John E. Martin
Winchester	G. R. Quarles
Waynesboro	F. M. Somerville
Washington	
Aberdeen	C. J. Powell
Anacortes	G. W. Greene
Bellingham	D. E. Wiedman
Bremerton	Tillman Peterson
Centralia	John W. Goddard
Everett	R. E. Cook
Hoquiam	H. C. Crumpacker
Kelso	C. H. Lillie
Longview	E. J. McNamara
Olympia	L. P. Brown
Port Angeles	H. G. Hanbloom
Puyallup	P. B. Hanawalt
Seattle	Worth McClure
Spokane	O. C. Pratt
Tacoma	Elmer L. Breckner
Vancouver	De Garis Reeves
Walla Walla	W. M. Kern
Wenatchee	G. M. Warren
Yakima	A. C. Davis
West Virginia	
Beckley	H. E. Carmichael
Bluefield	Edwin C. Wade
Charleston	Fred L. Teal
Clarksburg	J. A. Jackson (city district)
	M. P. Boyles (coal district)
Elkins	Walter Riddle
Fairmont	H. E. Odgers
Grafton	H. A. Rice
Hinton	E. W. Taylor
Huntington	C. L. Wright
Keyser	J. C. Sanders
Martinsburg	L. W. Burns
Morgantown	C. E. McCorkle
Moundsville	John C. Shreve
Parkersburg	H. W. Piggott
Princeton	Wilford McCutcheon
Richwood	D. E. Dean
South Charleston	G. W. Goode
Welch	Roy B. Shront
Wellsburg	C. L. McMahan
Weston	John Ruskin Hall

City	Superintendent
Wheeling	D. B. Kraybill
Williamson	F. R. Hanifan
Wisconsin	
Antigo	R. E. Balliette
Appleton	Ben J. Rohan
Ashland	I. O. Hubbard
Baraboo	A. C. Kingsford
Beaver Dam	W. R. Davies
Beloit	Frank E. Converse
Chippewa Falls	Robert F. Lohrie
Cudahy	A. L. Prodoehl
De Pere	T. J. McGlynn
Eau Claire	P. G. W. Keller
Fond du Lac	L. P. Goodrich
Fort Atkinson	Frank C. Bray
Green Bay	H. F. Sutton
Janesville	L. R. Creutz
Kaukauna	J. F. Cavanaugh
Kenosha	G. F. Loomis
La Crosse	G. M. Wiley
Madison	R. W. Bardwell
Manitowoc	Hugh S. Bonar
Marinette	C. E. Hulten
Marshfield	R. F. Lewis
Menasha	J. E. Kitowski
Menomonie	W. G. Ballentine
Merrill	George F. Brooks
Milwaukee	M. C. Potter
Monroe	E. O. Evans
Neenah	C. F. Hedges
Oconto	William C. Hansen
Oshkosh	Charles C. Bishop
Portage	A. J. Henkel
Racine	F. M. Longanecker
Rhinelander	W. F. Kruschke
Rice Lake	E. C. Hirsch
Sheboygan	Henry W. Kircher
Shorewood	H. S. Hemenway
South Milwaukee	Henry E. Smith
Stevens Point	P. M. Vincent
Two Rivers	Fred G. Bishop
Watertown	R. A. Buell
Waukesha	G. O. Banting
Waupun	H. C. Wegner
Wausau	S. B. Tobey
Wauwatosa	W. T. Darling
West Allis	T. J. Jones
Whitefish Bay	C. L. Mulrine
Wisconsin Rapids	A. R. Page
Wyoming	
Casper	R. S. Hicks
Cheyenne	A. S. Jessup
Laramie	A. A. Slade
Rock Springs	E. M. Thompson
Sheridan	J. J. Early

REFERENCES

(a) County superintendent.
(b) Parish superintendent.
(c) Acting.
(d) Division superintendent.

Section XIII

AIDS AVAILABLE TO LOCAL SCHOOL BOARDS FROM STATE DEPARTMENTS

Participation of State Agencies in Planning and Supervising Local School-Building Development

IN the planning of buildings for a public school system, it frequently is desirable to know the degree to which the state board of education has provided for participation and cooperation. The following summary segregates the character of the supervision given by the state and its representative agencies under three headings. The first item indicates the action which the state board may be expected to take. The second item shows the part played by the state superintendent of schools as the official spokesman for the state department of education. In the third part will be found indications of the assistance or guidance which other state agencies will give. The form of tabulation has necessitated the abbreviation of the statements covering these responsibilities, but the degree and character of participation are clearly shown in each state. The list has been revised up to February, 1931.

ABBREVIATED STATEMENT OF STATES' PARTICIPATION IN SCHOOL-BUILDING CONSTRUCTION

ALABAMA

State Board of Education, Montgomery
Approves rules and regulations for the hygienic, sanitary, and protective construction of school buildings.
State Superintendent, Dr. A. F. Harman
Prepares and submits to state board rules and regulations for hygienic, sanitary, and protective construction of school buildings.
The division of schoolhouse planning prepares plans and specifications for the erection and repairs of rural school buildings, and supervises the construction of state-owned buildings.
Director of Schoolhouse Planning, R. E. Ledbetter

ARIZONA

State Board of Education, Phoenix
No jurisdiction whatever in regard to buildings erected by districts.
State Superintendent, Dr. C. O. Case
Other Agencies
Board of health issues regulations.

ARKANSAS

State Board of Education, Little Rock
Has a division of school grounds and schoolhouse planning.
Director prepares plans for 1- to 7-teacher buildings, and for such buildings as teachers' homes, shops, home economics buildings, gymnasiums, etc.
Furnishes preliminary sketches of floor plans for larger buildings.
Checks architects' plans for school buildings upon request.
Advises school officials as to plans for remodeling, repairing and altering school buildings.
Advises superintendents and teachers as to interior arrangements, furniture and equipment.
Superintends the construction of all school buildings during progress of erection.
State Superintendent, C. M. Hirst
No legal provision for approval.
Director, School Plant Division, J. Odell Baker

CALIFORNIA

State Superintendent of Public Instruction, Vierling Kersey, Sacramento
Division of schoolhouse planning passes on all plans costing more than $5,000, excepting those in the largest cities; is called into consultation by city districts, and controls other situations by surveys.
Site sizes and locations controlled by state standards.
No building contract legal without department's approval.
This department does not make working drawings.
Chief of Division of Schoolhouse Planning, Andrew P. Hill, Jr.

COLORADO

State Superintendent of Public Instruction, Dr. Katherine L. Craig, Denver
School building handled by local boards of education.

CONNECTICUT

State Board of Education, Hartford
Has a bureau of building construction and maintenance which approves plans, though not because law requires it. Chief inspects school buildings for safety.
Publishes standards for guidance of local boards.
Has consulting architect to whom plans are referred, though not by law.
Assists local communities in building surveys.
State Commissioner, E. W. Butterfield

DELAWARE

State Board of Education, Dover
Outside Wilmington prepares a tentative program of school building to submit to local boards.
Hears comments and suggestions thereon.
Creates standards with effect of law, governing hygienic, sanitary, and protective construction; selection, arrangement, and maintenance of sites; condemns school buildings.
Has approval of plans and specifications.
State Superintendent, Dr. H. V. Holloway
Other Agencies
Legislature has created a state school-building act.
There is a state school-building account.
State school-building commission for each district.
Plans approved by state board of education and commission.
Buildings built by commission.
Construction supervised by commission.
Board of health has to approve drinking water and sewage disposal.

DISTRICT OF COLUMBIA

Superintendent of Schools, Frank W. Ballou, Washington
Local Board of Education passes on all plans for school buildings. These plans are submitted by the office of the Municipal Architect.
First Assistant Superintendent Crane is in charge of business affairs. This officer consults with the office of the Municipal Architect on matters pertaining to plans for buildings and improvement of grounds. He also advises with school officials and submits written reports to the Committee on Buildings, Grounds and Equipment of the Board of Education. This officer inspects all school buildings and is in charge of repairs and improvements. He is the liaison officer between the schools and the municipal government in matters pertaining to the physical welfare of the schools.

Other Agencies
The Health Officer of the District of Columbia issues reports on the sanitary inspection of buildings.
Representatives of the Fire Department of the District of Columbia visit the school buildings regularly for the protection of the schools.
Municipal Architect, Albert L. Harris

FLORIDA

State Superintendent of Public Instruction, Dr. W. S. Cawthon, Tallahassee
Has oversight, charge, and management of all matters pertaining to public schools, school buildings and grounds.

GEORGIA

State Superintendent of Schools, Dr. Mell L. Duggan, Atlanta
Furnishes plans and specifications for school-building guidance in local units.
Supervisor of schoolhouse construction prepares plans for 1- to 4-teacher buildings; prepares school ground plans; checks architect's plans; advises school officials.
Other Agencies
County superintendent and county board of education approve plans.
Supervisor of Schoolhouse Planning, J. B. Graham

IDAHO

State Board of Education, Boise
Standardization of:
Sanitary appliances
School furniture
School equipment and supplies
School buildings
Issues plans for 1-, 2-, 3-room buildings.
Requires approval of all plans.
State Commissioner, Dr. W. D. Vincent
Other Agencies
Department of public welfare has to cooperate with state board of education in its duties regarding schools.
County superintendent has power to require local trustees to conform to rules of state board "if there is money enough."
County board of health is responsible for sanitation in schools.

ILLINOIS

State Superintendent of Public Instruction, Dr. Francis G. Blair, Springfield
Prepares, with advice of state board of health, state architect, and state fire marshal, specifications for minimum requirements in heating, ventilation, lighting, seating, water-supply, toilets, safety against fire.
These have force of law.
Other Agencies
State architect is required to assist the state superintendent of schools.
Enforcement of law is in the hands of county superintendents and local authorities.
County superintendent approves plans according to standards of state board.
Advises school officials in details of construction, but only on standards is it necessary to follow him.
County superintendent inspects buildings.
Board of education required to submit plans to county superintendent.

INDIANA

State Superintendent of Public Instruction, Dr. Roy P. Wisehart, Indianapolis
Other Agencies
Local school trustees erect buildings. Plans and specifications must be submitted to state board of health for approval of sanitation and hygiene; to state board of accounts for adequacy of specifications and fair competition.
State board of health issues standards.

IOWA

State Superintendent of Public Instruction, Dr. Agnes Samuelson, Des Moines
Shall prepare and publish, when deemed necessary, a pamphlet containing suitable plans and specifications.

KANSAS

State Board of Education, Topeka
"No provision in the laws to prevent the erection of undesirable buildings or to compel the discontinuance of buildings that should be abolished immediately, further than plans for all new school buildings must be submitted to the state architect as to provision for fire protection according to law." Chap. 16, Revised School Laws of Kansas for 1927.
Has adopted standardization of rural schools involving among other things: out-building; school-building equipment; and the school building itself.
State Superintendent, Dr. George A. Allen, Jr.
Criticizes and approves plans submitted voluntarily by local authorities.
State Architect, J. W. Radotinsky

KENTUCKY

State Board of Education, Frankfort
Authorized to approve and adopt regulations for the sanitary and protective construction of public school buildings.
State Superintendent of Public Instruction, W. C. Bell
With concurrence of state board of health prepares regulations for the sanitary and protective construction of public school buildings. Prepares plans and specifications for 1- to 4-teacher public school buildings, for adoption by the state board of education. Examines and approves or disapproves plans and specifications submitted by county boards of education and graded boards of education.
Director of School Buildings and Grounds, J. W. Brooker

LOUISIANA

State Superintendent of Education, Dr. T. H. Harris, Baton Rouge
Approves plans which board of health regulations require submitting to him.
Other Agencies
Board of health regulations require submittal of plans to:
Parish superintendent of schools
State superintendent of schools
Parish health officer
for hygienic or necessary provision for ventilation, heating, light, fire protection.

MAINE

State Commissioner of Education, Bertram E. Packard, Augusta
No school building can be built or repaired without his approval.
Provides plans for 1- to 4-room buildings free of cost.
Issues minimum requirements so that local units will be able to meet his approval of plans.
Other Agencies
No school building can be built or repaired without approval of board of health.

MARYLAND

State Board of Education, Baltimore
Elementary schools. Standardization includes grounds, buildings, lighting, heating and ventilation, library, equipment.
Has issued "Standards for School Buildings" as a guide to county superintendents.
State Superintendent, Dr. Albert S. Cook
Sites and plans must be submitted to him for approval; additions to buildings also.
After plans have been approved by the state consultant architect, the state superintendent issues certificate without which no building can be erected (except Sec. 20, Chap. 506, 1916).
Other Agencies
Plans must be submitted to board of health for approval of sewage-disposal arrangements and plumbing.

MASSACHUSETTS

State Commissioner of Education, Dr. Payson Smith, Boston
Assistants of superintendent do much in consulting with local committees. Loan slides.
Other Agencies
Department of public safety must approve all plans.
Department of public safety issues regulations.

MICHIGAN

State Department of Public Instruction, Lansing
Must approve all plans and specifications for new school buildings, additions to school buildings, or the remodeling of old school buildings.
Has issued standards.
Makes surveys, free of cost, of local situations before local board has decided what program should be, upon invitation.
Provides complete plans and specifications free of charge for all 1- and 2-room buildings.
State Superintendent, Dr. Webster H. Pearce
Has authority to inspect and condemn.

MINNESOTA

State Board of Education, St. Paul
State aid for building of consolidated schools.
Prescribes rules for schoolhouse construction, including therein rules of the board of health relative to sanitary standards for toilets, water-supply, and disposal of sewage.

State Commissioner, James M. McConnell
Examines all plans and specifications with power of approval or otherwise.
He may condemn buildings under his own or the state board of education's rules.
Other Agencies
The law authorizes county superintendent to advise local school boards in regard to buildings and ventilation, but, as a matter of fact, the county superintendent does not exercise this power. All such questions come to commissioner of education.
Director, Division of Buildings and Sanitation, Samuel A. Challman

MISSISSIPPI

State Department of Education, Jackson
Has a division of school building service. This division:
Cooperates in making surveys on the effective organization of schools.
Makes surveys to determine building needs.
Outlines building programs.
Approves architects' plans and specifications for school buildings.
Furnishes free plans and specifications for some small school buildings, teachers' homes and accessory buildings.
General advisory service on school-plant planning and equipment and on the effective use of the school plant.
State Superintendent, Dr. W. F. Bond

MISSOURI

State Department of Education, Jefferson City
The state is a member of the National Council of Schoolhouse Construction. Blueprints, plans and specifications are furnished free of charge by the Department, through its connection with the National Council of Schoolhouse Construction. This work is only advisory.
Supervisor of Schoolhouse Construction, O. G. Sanford
Advises with school boards concerning the construction of the proper type of school buildings.
State Superintendent, Charles A. Lee

MONTANA

State Board of Education, Helena
Publishes a bulletin on 1- and 2-room rural buildings, containing drawings and plans.
State Superintendent, Dr. Elizabeth Ireland
Plans are furnished local boards by the board of health.

NEBRASKA

State Superintendent of Public Instruction, Charles W. Taylor, Lincoln

NEVADA

State Department of Education, Carson City
Deputy superintendent has authority to check plans for rural school buildings.
State Superintendent of Public Instruction, Walter W. Anderson

NEW HAMPSHIRE

State Board of Education, Concord
State Commissioner, James N. Pringle
Interprets meaning of "suitable and sanitary" buildings for all schools. Has general authority to make regulations. Cooperates with superintendents and local school boards in planning buildings.
Recommends to state board of health investigation of unsuitable buildings.
Other Agencies
State board of health, on complaint, may condemn or order buildings improved at expense of districts.

NEW JERSEY

State Department of Public Instruction, Trenton
Advice and consent to appointment of building inspector by commissioner.
Approves plans which must be submitted.
Has set up a code.
Has a business division with superintendent and director of school buildings.
State Commissioner, Dr. Charles H. Elliott
May instruct county and city superintendents as to constructing schoolhouses and furnishing them.
Appoints an inspector of buildings.
Other Agencies
County superintendent has power "to note" conditions of schoolhouses, sites, etc., and advise with local boards in respect to construction, heating and ventilation, and lighting.
Local boards provide school buildings.
Commissioner of charities and corrections shall examine and report on school buildings at request of commissioner of education.
Inspector of School Buildings, G. L. Kupp

NEW MEXICO

State Superintendent of Public Instruction, Mrs. Georgia Lusk, Santa Fe

NEW YORK

State Education Department, Albany
Has a division of school buildings and grounds with a chief.
Has set up standards.
Board issues a pamphlet of information for local authorities.
Makes inspections of sites and school conditions before definite action is taken by local authority.
Advises with superintendent, principals, and boards in regard to needs and best way to meet them.
Examines preliminary plans.
State Commissioner, Dr. Frank P. Graves
All plans and specifications must receive the commissioner's approval in all districts other than first and second class cities.
He cannot approve unless plans conform to laws.
No tax can be levied until plans are approved.
Director of School Buildings and Grounds Division, Joseph H. Hixson

NORTH CAROLINA

State Board of Public Instruction, Raleigh
Has a director of schoolhouse planning.
There is a special building fund from which loans are made when plans are approved.
State department has a set of standards.
Has plans purchased from architects which it distributes free.
State Superintendent, Dr. A. T. Allen
All plans must be submitted to state superintendent for approval, except in special charter schools.
Other Agencies
Plans must also be submitted to insurance commission for approval, also to state board of health.
Director of Schoolhouse Planning, John J. Blair

NORTH DAKOTA

State Superintendent of Public Instruction, Bertha R. Palmer, Bismarck
Plans must be submitted to and approved by superintendent.

OHIO

State Department of Education, Columbus
Director of surveys is provided, whose services may be given to determine the building needs of any district, and to check proposed building plans. All architects who are engaged in planning village and rural school buildings have responded to a request made by the director of surveys that he be permitted to go over the plans of all school buildings before they are put into final form.
State Director of Education, Dr. J. L. Clifton
Other Agencies
Has a state building code (very elaborate).
All plans must be approved by chief inspector of workshops and factories, except in cities having regularly organized building inspection departments.
District health commissioner checks plans for water-supply and sanitary arrangements. State department of health may make surveys and issue orders as to these matters.

OKLAHOMA

State Superintendent of Public Instruction, Dr. John Vaughan, Oklahoma City
Prepares complete plans and specifications for the construction of all school buildings for four teachers or less, costing less than $10,000.
Makes school-building survey for all sizes of buildings.
Approves plans of all sizes, but approval is not required by law.
Other Agencies
Standard building laws.
Book of 300 plans in hands of each county superintendent in the state.
Director of Schoolhouse Planning, Haskell Pruett

OREGON

State Superintendent of Public Instruction, C. A. Howard, Salem
Issues booklet giving suggested plans for 1-, 2-, and 3-room school buildings. No legal provision for the approval of the state department.
Other Agencies
Plans for 1-room schools must be approved by county school superintendents.
County superintendents advise with the school boards relative to the construction, warming, ventilating, and arrangement of schoolhouses.

PENNSYLVANIA

State Department of Public Instruction, Harrisburg
Has a director of bureau of school buildings.
Prescribes rules and regulations and has power to take such action as it may deem expedient to promote physical and moral welfare of school children.
Department code—
Required to approve plans in 2nd, 3rd, 4th class districts.
Supervises preparation of plans in local communities if asked to do so.
Submits, if asked, suggestive sketches.
Acting State Superintendent, Dr. James N. Rule
Other Agencies
State code.
Art commission passes on architectural design.
Department of labor and industry passes on fire and panic protection.
Director, Bureau of School Buildings, HuBert C. Eicher

RHODE ISLAND

State Commissioner of Education, Dr. Walter E. Ranger, Providence
Commissioner has printed pictures and plans in his annual report.

SOUTH CAROLINA

State Superintendent of Education, Dr. James H. Hope, Columbia
Division of schoolhouse planning and construction. Plans must be submitted to and approved by the director of schoolhouse planning.
The director inspects all plans and new buildings, and a certificate of approval is necessary before they can be used.
Plans and specifications and supervision of construction are furnished to small schools not employing an architect.
Other Agencies
Has a state building code.
Director of Schoolhouse Planning, S. P. Clemons

SOUTH DAKOTA

State Superintendent of Public Instruction, E. C. Giffen, Pierre
Plans must be approved by him, and show heating and ventilation scheme. He assists in an advisory capacity in the planning of school buildings; he also helps boards in various ways to show their communities the needs of new buildings and additions to buildings.

TENNESSEE

State Commissioner of Education, P. L. Harned, Nashville
Division of Schoolhouse Planning and Construction furnishes plans to boards desiring to build.

TEXAS

State Department of Education, Austin
Special state aid fund.
State Superintendent, Dr. S. M. N. Marrs
Other Agencies
School-building code.
Plans must be submitted as follows for approval: (1) in a common school district—to the county superintendent; (2) independent district and city or town—to superintendent of schools.
These agencies report to state department what they have done and transmit evidence.
State Director of School Plant Division, J. Fred Horn
Prepares plans for 1- to 6-teacher buildings, and suggestive sketches for larger buildings; advises school officials; checks architects' plans; makes school-building surveys upon invitation; visits local units upon invitation.

UTAH

Conditions reported uncertain

State Board of Education, Salt Lake City
There are two department building codes.
First is in abeyance though not exactly discarded.
They have operated under the second one 2 years.
State Superintendent, Dr. C. N. Jensen
Is required to formulate a code to govern preparation of plans by local communities.
May hire an architect to examine plans or inspect buildings.

VERMONT

State Board of Education, Montpelier
Public school buildings are standardized with "points" on buildings, grounds, equipment.
Plans "should be" submitted to state board.
Issues plans, pictures and bulletins.
State Commissioner, Dr. Clarence H. Dempsey
Other Agencies
Plans "must be" submitted to board of health.

VIRGINIA

State Board of Education, Richmond
Has a division of school buildings.
Prepares plans and specifications for smaller towns and cities.
Supervises construction free of charge.
Minimum standards have been set up and approved.
Cooperates with local boards in:
(a) Preparing preliminary plans.
(b) Getting out final plans.
(c) Present at opening of proposals.
(d) Inspection every 2 weeks during first stages of construction, additional upon request of contractor or local board.
State Superintendent, Dr. Sidney B. Hall
State Director, Division of Buildings, Raymond V. Long

WASHINGTON

State Board of Education, Olympia
Has been given "some power" through law on "wider use of school plant."
State Superintendent, Dr. N. D. Showalter
Other Agencies
County superintendents approve plans in 2nd and 3rd class districts.

WEST VIRGINIA

State Board of Education, Charleston
In districts with population less than 5,000, plans must be submitted for approval to board or its agent.
State Superintendent of Free Schools, William C. Cook

WISCONSIN

State Department of Public Instruction, Madison
Under a cooperative agreement between the industrial commission and the department, all school plans are sent to the latter by the commission for checking and suggestive criticisms looking towards the erection of first class buildings.
Helps local communities by making suggestive plans for all types of buildings to serve as a basis for extended work by commercial architects.
Service has been extended to cover expert advice on heating, ventilation, lighting.
The department develops complete plans and specifications and gives architectural service for 1- and 2-room rural schools on request.
Inspects all types of schools with a view to improving housing conditions and facilities; makes complete building surveys in all types of communities on request.
State Superintendent, John Callahan
Other Agencies
The law requires submission of all school plans to industrial commission. This checking refers primarily to the application of the state building code and pays attention primarily to construction, safety and sanitation.
Supervisor of Buildings, H. W. Schmidt

WYOMING

State Board of Education, Cheyenne
Prescribes standards which may include rules and regulations for the sanitary and hygienic construction of schoolhouses and the location and selection of grounds.
State Superintendent, Mrs. Katharine A. Morton

Section XIV

ARCHITECTS
FOR EDUCATIONAL BUILDINGS

The following directory is restricted to architects who, during the last six years, have designed three or more school or college buildings costing over $50,000 each.

Many of these architects have, of course, handled during this period a much larger amount of work in the educational field than that shown. Space limitations, however, have necessitated the restricting of each architect to three listings, and the buildings mentioned are regarded as typical examples of the architects' recent work.

No attempt has been made to evaluate the skill or professional standing of the architects listed. Boards of Education and persons interested in the construction of new buildings can obtain valuable advice in this matter from the presidents of the local chapters of the American Institute of Architects, or from the national headquarters of that organization, The Octagon, Washington, D. C., and from such sources as the National Advisory Council on School Building Problems, the United States Office of Education, the respective state departments of education, the Department of Education of the National Catholic Welfare Conference, and the Department of Educational Administration of Teachers College, Columbia University, New York.

The 48 states are arranged in alphabetical order, followed by the Canadian provinces in alphabetical order. Under each state and province the sequence is not by cities, but by architects' names for the entire state or province in alphabetical order.

ALABAMA

Fredrick Ausfeld, Montgomery
Sidney Lanier High School, Montgomery
Gymnasium Building, Montgomery
Junior High School, Montgomery

Denham & Denham, Birmingham
Fairfield High School, Fairfield
Ensley-Howard High School, Ensley (affiliated with Howard College, Birmingham)
Mountain Brook Elementary School, Jefferson County

Harry H. Jones, Montgomery
Dothan Elementary School, Dothan
Additions to Enterprise Elementary School, Enterprise
Senior High School, Chipley

Miller & Martin, Architects; **J. A. Lewis,** Engineer, Inc., Birmingham
Group of eight buildings for the University of Alabama, Tuscaloosa
Group of three buildings for Birmingham-Southern College, Birmingham
Two school buildings for Board of Education, Birmingham

Bem Price, Birmingham
Tupelo High School, Tupelo, Miss.
Minor High School, Jefferson County
Dormitory, Athens College, Athens

W. A. Rayfield, Birmingham
National Training School for Girls, Washington, D. C.
Banks School of Music, Birmingham
Alabama Association for the Blind, Birmingham.

George B. Rogers, Mobile
High School, Mobile
High School, Mobile
Library, Spring Hill College, Mobile

Matthews H. Tardy, Birmingham
Roanoke Senior High School, Roanoke, Va.
Roanoke Junior High School, Roanoke, Va.
Consolidated School, Rockymount, Va.

Warren, Knight & Davis, Birmingham
Erskine Ramsay Engineering Building, Alabama Polytechnic Institute, Auburn
Chemistry Building, University of Alabama, Tuscaloosa
New group of buildings, Alabama College, Montevallo

Wm. Leslie Welton, Birmingham
Athenaeum, Parochial School, Birmingham
Robinson School, Birmingham
Gorgas School, Birmingham

ARIZONA

Fitzhugh & Byron, Phoenix
Phoenix Junior College, Phoenix
Clarkdale High School, Clarkdale
Phoenix Union High School (colored), Phoenix

Lescher & Mahoney, Phoenix
Training School, Arizona State Teachers College, Temple
Stadium, Phoenix Union High School, Phoenix
John Greenleaf Whittier Grade School, Phoenix

Roy Place, Tucson
University of Arizona Group, Tucson
High School, Tucson
Grade School, Tucson

Trost & Trost, Phoenix (also El Paso, Texas)
Loretta College, El Paso, Texas
Library, Sul Ross Teachers College, Alpine, Texas
Winslow High School, Winslow

V. O. Wallingford, Phoenix
James Russell Lowell Public School, Phoenix
Emerson School, Third Unit, Phoenix
Bishop Atwood Memorial Church School, Phoenix

ARKANSAS

Almand & Stuck, Little Rock
Morrilton High School, Morrilton
Bentonville High School, Bentonville
Little Rock Senior High School, Little Rock (Mann & Stern, John Parks Almand, and Wittenberg & Delong, Associate Architects)

James Dinwiddie, Fayetteville
High School with Annexes, Fayetteville
Junior-Senior High School, Springdale
Junior-Senior High School, Gentry

George R. Mann, Wanger & King, Little Rock
North Little Rock High School, North Little Rock
Hickory Street School, North Little Rock
Four rural schools, Pulaski County

Eugene John Stern, Little Rock
Little Rock Senior High School and Junior College, Little Rock
Pulaski Heights Grade School, Little Rock
Hot Springs Junior High School, Hot Springs

Witt, Seibert & Halsey, Texarkana (also Texarkana, Texas)
Junior College, Texarkana
High School, Texarkana
Practice Building and Library, State Teachers College, Conway

Wittenberg & De Lony, Little Rock
Dunbar High School (colored), Little Rock
Desarc High School, Desarc
Forrest City High School, Forrest City

E. J. Wolpert, Jonesboro
Woodland Junior High School, Jonesboro
Tyronza High School, Tyronza
North School, Jonesboro

CALIFORNIA

Allison & Allison, Los Angeles
Auditorium and classroom building, University of California, Los Angeles
Physics Building, University of California, Los Angeles
Kerckhoff Union Building, University of California, Los Angeles

Arthur W. Angel, Los Angeles
Auditorium Building and Intermediate School, Irvington Intermediate School, Huntington Park
Elementary School, Huntington Park

W. Horace Austin, Long Beach
Olive Avenue Junior High School, Compton
Addition to Woodrow Wilson High School, Long Beach (not yet built)
Addition to Long Beach Polytechnic High School, Long Beach (not yet built)

Richard M. Bates, Jr., Los Angeles
La Ballona Junior High School, Culver City
South Whittier Junior High School, Whittier
Azusa City School, Azusa

Edwin Bergstrom, Los Angeles
Auditorium and Administration Building, John C. Fremont High School, Los Angeles
Science and Shop Buildings, same
Boys' and Girls' Gymnasium Buildings, same

Charles H. Biggar, Bakersfield
Kern County Union High School Group
Lincoln School, Bakersfield
Standard School, Oildale

Howard G. Bissell (formerly Mayo, Bissell & Co.), Stockton
Auditorium and Conservatory Building, College of the Pacific, Stockton (associated with Dairs-Pearce Co., Stockton)
New group of buildings, Calaveras Union High School, San Andreas

Leon Caryl Brockway, Pasadena
Jefferson Elementary School, Pasadena
Arroyo Seco School, Pasadena
Freemont School, Pasadena

Birge M. Clark, Palo Alto
Palo Alto Union High School, Palo Alto
Washington Union High School Gymnasium, Centerville
Group of buildings for Menlo School for Boys, Atherton

Orville L. Clark, Los Angeles
Paso Robles Union High School, Paso Robles
Russell Elementary School, Los Angeles
Glendale Elementary School, Glendale

W. D. Coates, Jr., Co., Fresno
Hanford Union High School, Hanford
Porterville Union High School, Porterville
Sanger Union High School, Sanger

Alfred I. Coffey, San Francisco
Sequoia Union High School, Redwood City
Mountain View Grammar School, Mountain View
Redwood City Grammar School, Redwood City

Louis N. Crawford, Santa Maria
Goleta Union School, Goleta
El Camino Street School, Santa Maria
San Luis Obispo Junior High School, San Luis Obispo

Crim, Resing & M'Guinness, San Francisco
James Lick Junior High School, San Francisco
Park Presidio Junior High School (first unit), San Francisco
Park Presidio Junior High School (second unit), San Francisco

Davis-Pearce Co., Stockton
The College of the Pacific, Stockton
Marysville Union High School, Marysville
Manteca Union High School, Manteca

Charles F. Dean, Sacramento
Sacramento Junior College, Sacramento
Redding High School, Redding
Lincoln Grammar School, Sacramento

John J. Donovan, Oakland
St. Mary's College Group, Moraga
Eureka Junior High School, Eureka
College of Notre Dame, Belmont

Edwards & Schary, San Francisco
Park School, San Mateo
Borel School, San Mateo
Soledad School, Soledad

Frederick H. Eley, Santa Ana
Julia Lathrop Junior High School, Santa Ana
Roosevelt Grade School, Santa Ana
Gymnasium, High School, Santa Ana

Gable & Wyant, Los Angeles
Hawthorne Elementary School (three buildings), Beverly Hills
Beverly Vista Elementary School (four buildings), Beverly Hills

Louis J. Gill, San Diego
Scripps Institute of Oceanography Laboratory, University of California, San Diego
Bishop's School for Girls, La Jolla
La Jolla Elementary School, La Jolla

William C. Hays, San Francisco
Giannini Hall, University of California, Berkeley
Animal Science Building, University of California, Davis
Agricultural Engineering Building, University of California, Davis

Myron Hunt & H. C. Chambers, Los Angeles
Library, Orr Hall and Erdman Hall (women's dormitories), Students' Union and Music Building, Gymnasium and Pool, Occidental College, Eagle Rock, Los Angeles
Whittier Union High School Group, Whittier
Girls' Collegiate School, Glendora

Arthur R. Hutchason, Los Angeles
Rockdale School, Los Angeles
Preventorium School, Santa Barbara
San Luis Rey School, San Luis Rey

William Templeton Johnson, San Diego
Addition to La Jolla High School, La Jolla
Alexander Hamilton School, San Diego
Mabel Shaw Bridges Music Auditorium for Claremont Colleges, Claremont

Howard E. Jones, San Bernardino
San Bernardino Valley Junior College, San Bernardino
Woodrow Wilson School, San Bernardino
San Bernardino Junior High School, San Bernardino

Clarence A. Kelso, Los Angeles
Abraham Lincoln Elementary School, Lynwood (H. E. Mackie, Associate Architect)
Charles A. Lindbergh Elementary School, Lynwood (H. E. Mackie, Associate Architect)
Century Square Elementary School, Lynwood (H. E. Mackie, Associate Architect)

Frederick Kennedy, Jr., Pasadena
Frances E. Willard School, Pasadena
Woodrow Wilson Junior High School, Pasadena
Astronomy Building, Pasadena Junior College, Pasadena

T. C. Kistner & Co., Los Angeles
John C. Fremont Junior High School, Pomona
Herbert Hoover High School, San Diego
Leuzinger High School, Lawndale

Krempel & Erkes, Los Angeles
Bret Harte Junior High School, Los Angeles
118th Street School, Los Angeles
1st Street School Addition, Los Angeles

J. A. Larralde, Los Angeles
Mill School, near Whittier
Norwalk School, Norwalk
Wiseburn School, Hawthorne

Marsh, Smith & Powell, Los Angeles
Physical Education Building, University of Redlands, Redlands
Junior High School, South Pasadena
Newport Harbor Union High School, Orange County

Mott M. Marston, Los Angeles
Gymnasium, Puente Union High School, Puente
Glenoaks School, Glendale
Washington School, Ventura

Marston, Van Pelt & Maybury, Pasadena
Andrew Jackson Grammar School, Pasadena
Longfellow Grammar School, Pasadena
Central Junior High School, Riverside

Albert C. Martin, Los Angeles
Conaty Memorial High School, Los Angeles
Lomita High School of Los Angeles group
Los Angeles Junior Seminary, Los Angeles

Miller & Pflueger, San Francisco
Jefferson Elementary School, San Francisco
Alamo Elementary School, San Francisco
Roosevelt Junior High School, San Francisco

Miller & Warnecke, Oakland
Castlemont Senior High School, Oakland
Merritt High School, Oakland
Garfield Junior High School, Oakland

DeWitt Mitcham, San Bernardino
Thomas Jefferson Elementary School, San Bernardino
San Bernardino Valley Junior College Gymnasium, San Bernardino
D Street Elementary School, Needles

Morgan, Walls & Clements, Los Angeles
Chouinard School of Art, Los Angeles
Auditorium Unit, Polytechnic High School, Los Angeles
Rosemead Grammar School, Rosemead

Karl W. Muck, County Architect, Los Angeles
Juvenile Hall School (for delinquent minors), Los Angeles
El Retiro School (Girls' Rehabilitation School), San Fernando
Occupational Therapy School (for consumptive children), Olive View

James T. Narbett, Richmond
Roosevelt Junior High School, Richmond
Fairmont Grade School, Richmond
Woodrow Wilson Grade School, Richmond

A. S. Nibecker, Jr., South Pasadena
Audubon Junior High School, Los Angeles
Owensmouth High School, Owensmouth
Shenandoah Elementary School, Los Angeles

E. L. Norberg & John E. Norberg, San Francisco
San Mateo High School Group, San Mateo
High School Gymnasium, Burlingame
San Carlos Central School, San Carlos

John Parkinson & Donald B. Parkinson, Los Angeles
University of Southern California, Los Angeles:
Bridge Hall
Student Union Building
Physical Education Building

Pierpont & Walter S. Davis, Los Angeles
Sierra Park School, Los Angeles
Stanford Avenue School, Los Angeles
Palo Verde School, Los Angeles

Roy Seldon Price
Horace Mann School, Beverly Hills
Boynton School, Boynton, Ark.
Lenox Hall additions, St. Louis, Mo.

Scott Quintin, Alhambra
Woodrow Wilson School, San Gabriel
Auditorium, Granada School, Alhambra
Auditorium, Fremont School, Alhambra

Lloyd Rally, Los Angeles
Fremont Avenue Elementary School, Los Angeles
Boys' Gymnasium, Whittier Union High School, Whittier
Classroom Building, Whittier Union High School, Whittier

W. H. Ratcliff, Jr., Berkeley
New group of buildings, Mills College, Oakland (also, general scheme for future development)
New group of buildings, Pacific School of Religion (also, general scheme for future development)
Hillside School, Berkeley

Alfred W. Rea & Charles E. Garstang, Los Angeles
Group of buildings for El Segundo High School, El Segundo
Chemewa Junior High School, Riverside
Polytechnic High School Gymnasium, Riverside

Reed & Corlett, Oakland
Chabot Grammar School, Oakland
Additions to Dixon Grammar School, Dixon
Oakland High School, Oakland

Winchton Leamon Risley, Los Angeles
Grammar School, Rivera
Norfolk Street Grammar School, Los Angeles
Dominguez School, Los Angeles

Francis W. Rutherford, Santa Monica
Madison (platoon) School, Santa Monica
Valley Junior High School, Burbank
Emerson Elementary School, Burbank

Howard Schroder, Oakland
Lowell Junior High School, Oakland
Prescott Domestic Science unit, Oakland
Cole Elementary School, Oakland

George C. Sellon & Co., Sacramento
Colusa Union High School, Colusa
Loomis Union Grammar School, Loomis
Benicia High, Benicia

Shields, Fisher & Lake, Fresno
Roosevelt High School, Fresno
Addition to Hanford High School, Hanford
Benjamin Franklin School, Fresno

Henry C. Smith, San Francisco
Hayward Union High School Group, Hayward
Gonzales Union Grammar School, Gonzales

Windsor Soule & John Frederick Murphy, Santa Barbara
McKinley Elementary School, Santa Barbara
Harding Kindergarten-Primary School, Santa Barbara
Frederick-Forrest Peabody Elementary School, Santa Barbara

Starks and Flanders, Sacramento
Davis Joint Union High School, Davis
Williams Union Grammar School, Williams
Crocker Elementary Grade School, Sacramento

Swartz & Ryland, Fresno
Academic Building, Monterey Union High School District, Monterey
Heaton Elementary School, Fresno
Gymnasium, High School, Coalinga

Edward Cray Taylor & Ellis Wing Taylor, Architects and Engineers, Los Angeles
Cabrillo Avenue Elementary School, San Pedro
Home Gardens School, Los Angeles
Hooper Avenue Elementary School, Los Angeles

Ralph D. Taylor, Alturas
Roosevelt Elementary School, Susanville, Lassen County
High School Group, Greenville, Plumas County
Gymnasium Building, Modoc Union High School, Alturas

Walker & Eisen, Los Angeles
Thomas A. Edison Junior High School, Los Angeles
Humphreys Avenue School, Los Angeles
South Park School, Los Angeles

W. H. Weeks, San Francisco
La Cumbre Junior High School, Santa Barbara
Santa Rosa High School, Santa Rosa
Woodrow Wilson Junior High School, San Jose

G. Stanley Wilson, Riverside
Corona High School, Corona
Brawley Junior College, Brawley
Upland Junior High School, Upland

Roy C. Wilson, Santa Paula
Isbell Grammar School, Santa Paula
Ojai High School, Ojai
Hueneme Grammar School, Hueneme

Carleton Monroe Winslow, Los Angeles
Fullerton Union High School Group, Fullerton
Eagle Rock High School, Los Angeles
Knapp College of Nursing, Santa Barbara

Henry J. Withey, Los Angeles
Fries Avenue Elementary School, Wilmington
Malabar Street Elementary School, Los Angeles
Van Nuys Elementary School, Van Nuys

COLORADO

J. B. Benedict, Denver
Graland Primary School, Denver
Rosedale Primary School, Denver
St. Thomas Seminary and Chapel, Denver

William N. Bowman Co., Denver
Gymnasium, State Teachers College, Greeley
Cole Junior High School, Denver
High School, Fort Collins

T. H. Buell & Co., Denver
Horace Mann Junior High School, Denver
Asbury Elementary School, Denver
High School, Ovid

Walter DeMordaunt, Pueblo
Park Hill Junior High School, Pueblo
Pleasant View High School, Pueblo
Additions to Junior High School, District No. 20, Pueblo

H. W. J. Edbrook, Denver
Dormitory and Academic Building, Loretto Heights College, Denver
Valverde School, Denver
Arvoda High School, Arvoda

M. S. Fallis Architect Co., Denver
Garden Place School, Denver
Colorado Woman's College, Denver
Glenwood Springs High School, Glenwood Springs

William E. & Arthur A. Fisher, Denver
South High School, Denver
Morey Junior High School, Denver
Alamosa High School, Alamosa

Robert K. Fuller, Denver
Edison School, Denver
Junior High School, Boulder
Eaton High School, Eaton

Eugene G. Groves, Denver
Library, Colorado Agricultural College, Fort Collins
High School, Canon City
High School, Pine Bluffs, Wyoming

Henry James Manning, Denver
Library, Denver University, Denver
Residence Hall, Regis College, Denver
Fairmont Grade School, Denver

G. Meredith Musick
Bryant-Webster Grade School, Denver
Beach Court Grade School, Denver
Colorado State Industrial School, Golden

I. H. & W. M. Rapp Co., Trinidad
Willson Hall—Science Building for New Mexico Military Institute, Roswell, N. Mex.
Cahoon Armory for New Mexico Military Institute, Roswell, N. Mex.
Junior High School, Roswell, N. Mex.

E. Floyd Redding, Denver
Opportunity School (Vocational High School), Denver
High School, Nogales, Ariz.
Nurses School and Dormitory, Boulder-Colorado Sanitarium, Boulder

Geo. H. Williamson, Denver
East Senior High School, Denver
William H. Smiley Junior High School, Denver
Lincoln School, Denver

CONNECTICUT

Isaac A. Allen, Jr., Inc., Hartford
Colonel William E. Cone School, Hartford
Vine Street School, Hartford
Addition to Vine Street School, Hartford

Leonard Asheim, Bridgeport
Devon School, Milford
Roosevelt School (City Normal), Bridgeport
Waltersville School, Bridgeport

Russell F. Barker, Hartford
William Thompson Sedgwick School, West Hartford
Charter Oak Elementary School, West Hartford
Elmwood Elementary School, West Hartford

Fred'k H. Beckwith, Bridgeport
Wilcoxson Avenue School, Stratford
Central Junior High School, Norwalk
Nichols School, Stratford

Brown & Von Beren, New Haven
Fair Haven Junior High School, New Haven
Simeon Baldwin School, New Haven
Atwater Street Training School, New Haven

Walter P. Crabtree, Hartford
Lincoln Elementary School, New Britain
Federal Hill Elementary School, Bristol
Vocational High School, New Britain

A. Graham Creighton, New London
Hand Academy, Madison
Charles B. Jennings Grammar School, New London
Rutland High School, Rutland, Vt.

R. W. Foote, New Haven
West Haven High School, West Haven
Branford High School, Branford
Silsbey Science Hall, Talladega, Ala.

Thomas M. Freney, Waterbury
Crosby High School, Waterbury
Bunker Hill School, Waterbury
Woodrow Wilson School, Waterbury

George H. Gray, New Haven
Berea College, Berea, Ky.
South Campus: Rogers Hall (Girls' Dormitory); Woods-Penniman Building (Women's Union)
North Campus: Emery Building (Domestic Science); Science Hall; Seabury Gymnasium for Men
East Campus: Agricultural Building

Office of Lorenzo Hamilton, Inc., Meriden
New unit, Roger Sherman School, Meriden
New unit, John Barry School, Meriden
State Trade School, Meriden

William E. Hunt, Torrington
Central Grade School, Winsted
Greenwood School, Winsted
Forbes School, Torrington

Joseph A. Jackson, New Haven
St. Stephen's School, Bridgeport
St. Hedwig's School, Floral Park, N. Y.
St. Stanislaus School, Trenton, N. J.

Wm. D. Johnson, Hartford
Francis Stillman Grammar School, Wethersfield
Holcomb Street Grammar School, Hartford
Third addition, Holcomb Street Grammar School, Hartford

Malmfeld, Adams & Prentice, Hartford
State Trade School, Hartford
West Middle School, Hartford
Brooks School, Andover, Mass.

William T. Marchant, Hartford
Meadow District School, East Hartford
Center School, Farmington
Ridge Road School, Wethersfield

Mylchrust & Reynolds, Hartford
Our Lady of Sorrows Parochial School, Hartford
Washington Street School, Hartford
Sigma Chi Fraternity House, Wesleyan University, Middletown

Delbert K. Perry & Earle K. Bishop, New Britain
Science Building and Pathological Laboratory, Connecticut Agricultural College, Storrs
Junior High School, Newington

Ernest A. Southey, Bridgeport
Bassick Junior High School, Bridgeport
Alteration, Beardsley School, Bridgeport
Danbury High School, Danbury

Towner & Seller Associates, Inc., Middletown
Woodrow Wilson High School, Middletown
City District High School, Middletown
High School, New Milford

Whiton & McMahon, Hartford
Clarence A. Barbour School, Hartford
Hillside Avenue School, Hartford
Frank A. Brackett School, Hartford

DELAWARE

E. William Martin, Wilmington
Avongrove High School, Avondale, Pa.
Sellersville-Perkasie High School, Perkasie, Pa.
Kennett Consolidated School, Kennett Square, Pa.

DISTRICT OF COLUMBIA

Albert I. Cassell, Washington
Howard University group, Washington:
College of Medicine
Gymnasium, Armory and Stadium
Women's Dormitories (group of five buildings)

Albert L. Harris, Municipal Architect, Washington
McKinley High School, Washington
Garnet Patterson Junior High School, Washington
E. A. Paul Junior High School, Washington

H. G. Little, Washington
Grade School Group, Wauchula, Fla.
Zolfo School Group, Zolfo, Fla.
Ft. Meade High School, Ft. Meade, Fla.

Milburn-Heister & Co., Washington
Junior High School, Durham, N. C.
Parochial School, Washington
De LaSalle College, Washington

Rossel Edw. Mitchell, Washington
Methodist Protestant College, High Point, N. C.
High School, Bethesda, Md.
Grade School, Falls Church, Va.

M. F. Moore, Washington
St. Augustine's School, Convent, Church, Rectory Hall, Washington
Bon Secours Convent, Washington
St. Martin's School, Convent, Washington

Upham and Adams, Washington
Washington-Lee High School
Leesburg High School, Leesburg, Va.
Mt. Rainier High School, Mt. Ranier, Md.

L. P. Wheat, Jr., Washington
Several grade schools and one Junior High School for the Board of Education, Montgomery County, Md.

FLORIDA

Franklin O. Adams, Tampa
Plant High School, Tampa
Brewster Vocational School, Brewster
Henry B. Mitchell Graded School, Tampa

Carpenter & Bent, De Land
Senior and Junior High School, New Smyrna
Seabreeze Elementary School, Daytona Beach
Volusia Avenue Grade School, Daytona Beach

Edward D. Fitchner, Tallahassee
St. Andrews Grade School, St. Andrews
Bay County High School, Panama City
Jackson County High School, Marianna

August Geiger, Miami
Shenandoah Junior High School, Miami
Robert E. Lee Auditorium, Miami
Ojus School, Ojus

Mellen C. Greeley, Jacksonville
John Gorrie and Edmund Kirby Smith Junior High School Annex buildings, Jacksonville
Madison High School, Madison
Greenville High School, Greenville

Harry M. Griffin, Daytona Beach
Junior-Senior High School, Daytona Beach
Junior-Senior High School, Leesburg
Junior-Senior High School, Titusville

Arch D. Holsinger, Lakeland
Highlands City School, Highlands City
Grammar School, Haines City
District No. 16 Consolidated School, Kathleen

Bert D. Keck, Stuart
Stuart High and Grade School, Stuart
Indiantown Grade School, Indiantown
Salemo Grade School, Salemo

Francis J. Kennard & Son, Tampa
Hillsborough High School, Tampa
Memorial Junior High School, Tampa
West Tampa Junior High School, Tampa

Kiehnel & Elliott, Miami
Miami Senior High School, Miami
Group of buildings, Coral Gables Elementary School, Coral Gables
Rollins College, Winter Park, Fla.

Maurice E. Kressly, Orlando
Greensburg Junior-Senior High School, Greensburg, Pa.
Lincoln High School, Ridgeway, Pa.
St. James' Roman Catholic Parish School, Orlando

Mark & Sheftall, Jacksonville
Robert E. Lee and Andrew Jackson High Schools, Jacksonville
High and Grade School, Crescent City, Putnam County
Elementary School, Palatka, Putnam County

H. Hastings Mundy, Miami
Ada Merritt Junior High School, Miami
Dade County Agricultural Senior High School, Miami
Gymnasium, Dade County Agricultural Senior High School, Miami

Jefferson D. Powell, Jacksonville
Norwood Public School, Jacksonville
Marietta Public School, Jacksonville
Public School, Folkston, Ga.

E. L. Robertson & L. R. Patterson, Miami
Auditorium and Cafeteria, Riverside School, Miami
Auditorium and Cafeteria, Highland Park School, Miami
Miami Shores School, Miami

Henry L. Taylor, St. Petersburg
South Side Junior High School, St. Petersburg
Lakeview Avenue Grade School, St. Petersburg
Grade School for Colored Children, St. Petersburg

Nat Gaillard Walker, Fort Myers
Primary and Grade School, Estero
Primary and Grade School, West Fort Myers
Grade and High School, Boca Grande

Rudolph Weaver, Gainesville
Library, Florida State College for Women, Tallahassee
Gymnasium, Florida State College for Women, Tallahassee
Stadium, University of Florida, Gainesville

Walker D. Willis, Pensacola
George Halmark School, Pensacola
Crestview School, Crestview
Tate Agricultural School, Gonzalez

Frank A. Winn, Jr., Tampa
Benjamin Franklin Junior High School, Tampa
Wimauma Elementary-High School, Wimauma
John T. Kenley Elementary School, Uceta

GEORGIA

Cletus W. Bergen, Savannah *
Dining Hall, Georgia State Industrial College, Savannah
49th Street Graded School, Savannah (Consulting Architect)
Florance Street Graded School, Savannah (Consulting Architect)

Edward F. Billie, Atlanta
High School, Fort Valley (associated with Lockwood and Poundstone)
Auditorium and Gymnasium Wing, Alabama Military Institute, Anniston, Ala.
High School, Live Oak, Fla.

A. Ten Eyck Brown, Atlanta
Newberry High School, Newberry, S. C.
Fullerwood School, St. Augustine, Fla.
Canton High School, Canton

Harold Bush-Brown & J. H. Gailey, and Associates, Atlanta
N. E. Harris Hall (dormitory), Georgia School of Technology, Atlanta (Bush-Brown & Stowell, Architects, J. H. Gailey, Associate)
Dining Hall, Georgia School of Technology, Atlanta
Daniel Guggenheim School of Aeronautics, Georgia School of Technology, Atlanta

Wm. J. J. Chase, Atlanta
High and Grammar Schools, Monroe
Rabun Gap-Nacoochee School, Rabun Gap
Moultrie High School, Moultrie

Daniell & Beutell, Atlanta
William A. Russell High School, Fulton County, Atlanta
Marietta High School, Marietta
Sparks-Adel High School, Adel

Dennis & Dennis, Macon
High School, Shellman
Grade & High School, West Point
School Building, Cuthbert

W. Elliott Dunwody, Jr., Macon
Bruce Grammar School, Macon (associated with Shelverton & Oliphant)
Law Building, Mercer University, Macon
New group of buildings, Wesleyan College, Macon (associated with Walker & Weeks, Cleveland, Ohio)

Edwards & Sayward, Atlanta
Classroom Building, Winthrop College, Rock Hill, S. C.
Columbia Theological Seminary, Atlanta
Girls Senior High School, Atlanta

Hentz, Adler & Shutze, Atlanta
Fulton County High School, Atlanta
School of Commerce and Journalism Building, University of Georgia, Athens
Science Building, Spelman College, Atlanta

Chas. H. Hopson, Atlanta
Clark University, Atlanta
Gammon Theological Seminary, Atlanta
Joel Chandler Harris Grammar School, Atlanta

Willis Irvin, Augusta
Additions and alterations, Girls High School, Augusta
Allendale Centralized School, Allendale, S. C.
William Robinson School, Augusta

Ivey & Crook, Atlanta
Chemistry Building, Emory University, Atlanta
Emory Junior College, Valdosta
Druid Hills District School, Decatur

Levy & Clarke, Savannah *
East Side Baldwin Kindergarten, Savannah (Cletus W. Bergen, Associate Architect)
Annex, Waters Avenue School, Savannah (Cletus W. Bergen, Associate Architect)
Florance Street School, Savannah (Cletus W. Bergen, Associate Architect)

T. F. Lockwood, Columbus
Central High School, Phenix City, Ala.
Vocational Building, Industrial High School, Columbus
Group of three buildings, Fitzgerald

Walter P. Marshall, Savannah *
Religious Education School, Savannah
Annex, Waters Avenue School, Savannah
49th Street School, Savannah

Morgan, Dillon & Lewis, Atlanta
Administration Building, Oglethorpe University, Atlanta
Founders Tower Group, same
Lupton and Lowry Halls, same

G. Lloyd Preacher & Co., Inc., Atlanta
Tubman High School for Girls, Augusta
Lanier High School for Boys, Macon
Evans High School, Spartanburg, S. C.

Arthur Neal Robinson, Atlanta
David T. Howard School, Atlanta
Dormitory, Eldridge Academy, Eldridge, Ala.
Rabun Valley High School, Dillard

Scroggs & Ewing, Augusta
Academy of Richmond County and Junior College, Augusta
Monte Sano Grammar School, Augusta

Percy Sugden, Savannah *

Wallin & Comer, Savannah *

HAWAII

Louis E. Davis, Honolulu
Administration and Auditorium, McKinley High School, Honolulu
Academic Buildings "A," McKinley High School, Honolulu
Academic Buildings "B," McKinley High School, Honolulu

C. W. Dickey, Honolulu
Maunawili Training School for Girls (Administration and Classroom Building, 3 dormitories, Superintendent's house), Honolulu
Territorial Normal School, Honolulu
Kamehameha School (Library, Dining Hall, Gymnasium, 3 dormitories, Practice Cottage), Honolulu (Mayers, Murray & Phillip, Associate Architects)

Marshall H. Webb, Honolulu
St. Louis College (five buildings), Honolulu
Central Grammar School, Honolulu

IDAHO

Frank H. Paradice, Jr., Pocatello
Central School, Blackfoot
High School, Blackfoot
Girls' Dormitory, Southern Branch, University of Idaho, Pocatello

Wayland & Fennell, Boise
Administration and Library Building, Albion State Normal School, Albion
High School, Payette
High and Grade Schools, Shoshone

ILLINOIS

Ralph E. Abell Co., Chicago
Palatine Township High School, Palatine
McHenry Community High School, McHenry
Arlington Heights Township High School, Arlington Heights

Aldrich & Aldrich, Galesburg
Bateman School, Galesburg
Alice Ingersol Gymnasium, Canton
Grade and High School, Perry

Aschauer & Waggoner, Decatur
Springfield Junior College, Springfield
St. James School, Decatur
Blessed Sacrament School, Springfield

Ashby, Ashby & Schulze, Chicago
Junior High School, Riverside
Grant Community High School, Fox Lake
Thomas Jefferson School, Berwyn

F. E. Berger & R. L. Kelley, Champaign
Mattoon High School, Mattoon
St. Anne High School, St. Anne
Cerro Gordo High School, Cerro Gordo

Berlin & Swern, Chicago
Dormitories, Beloit College, Beloit, Wis.
Religious Education Building, First Congregational Church, Oak Park

Bradley & Bradley, Rockford
Community High School, South Beloit, Wis.
John W. Henney Grade School, Freeport
Community High School, Stillman Valley

* All the public school work in Savannah is handled by the architectural firms in the city belonging to the American Institute of Architects. These firms are: Cletus W. Bergen, Levy & Clarke, Walter P. Marshall, Percy Sugden, Wallin and Comer.

Herbert A. Brand, Chicago
St. Paul's Evangelical Lutheran School, Indianapolis, Ind.
Gymnasium, Concordia Teachers College, River Forest
Dormitory, Evangelical Theological Seminary, Naperville

Brooks, Bramhall & Dague, Decatur
Johns Hill Junior High School, Decatur
Washington Grade School, Decatur
Centennial Junior High School, Decatur

Cervin & Stuhr, Rock Island
High School, Moline
High School and Grade School, Hanover
Stadium, High School, Rock Island

Childs & Smith, Chicago
Nichols Intermediate School, Evanston
Longfellow Elementary School, Pontiac, Mich.
Lincoln High School, Wisconsin Rapids, Wis.

John D. Chubb, Chicago
Senior High School, Quincy (Associate Architect with George P. Behrensmeyer, Quincy)
Maine Township High School, Cook County
Lincoln Junior High School and Boiler House, Kenosha, Wis.

Edwin H. Clark, Inc., Chicago
Ferry Hall, Lake Forest, Ill.
Chicago Latin School, Chicago (Boys; also Girls)
Group of buildings, North Shore Country Day School, Winnetka

J. E. Coyle, Joliet
Lockport High School, Lockport
Crete Grade School, Crete
Geneva Grade School, Geneva

S. Lester Daly, Metropolis
Herrin Grade School, Herrin
Gymnasium, Johnston City Township High School, Johnston City
Gymnasium, Metropolis Community High School, Metropolis

Deal & Ginzel, Lincoln
Gymnasium, Lincoln
High School, Lincoln
High School, Mason City

Doerr & Doerr, Chicago
Community Junior High School, Blue Island
Evergreen Park Grade School, Evergreen Park
Loretto Academy, Chicago

Hamilton B. Dox, Peoria
Academy of Our Lady (Girls' Catholic High School) Peoria
St. Bernard's Parochial School, Peoria
Franklin School, Peoria

N. Max Dunning, Chicago
Glenbard Township High School, Glen Ellyn (auditorium and classroom addition)
Irving School, Maywood (Van Gunten & Van Gunten, Associate Architects)
Stevenson School, Melrose (Van Gunten & Van Gunten, Associate Architects)

George G. Elmslie, Chicago
Forbes Hall of Science, Yankton College, Yankton, S. Dak.
Memorial Chapel, Yankton College, Yankton, S. Dak.
Power-Plant, Yankton College, Yankton, S. Dak.

Hermann J. Gaul & Son, Chicago
St. Michael's High School, Chicago
Sacred Heart Elementary School, Chicago
St. Benedict's Elementary School, Chicago

Paul Gerhardt, Chicago
Lane Technical School, Chicago
Parker Junior High School, Chicago
Austin Senior High School, Chicago

R. Z. Gill & Co., Murphysboro (also St. Louis, Mo.)
Du Quoin Township High School, Du Quoin
Rebuilding—Murphysboro Township High School, Murphysboro
Logan Junior High School, Murphysboro

Leonard Anthony Gliatto, Chicago
Mt. St. Mary's Academy, St. Charles
Our Lady of Perpetual Help, Glenview
Gymnasium, De La Salle Institute, Chicago

Granger & Bollenbacher, Chicago
Women's Memorial Residence Hall, Indiana University, Bloomington, Ind.
Pierce Hall (Men's Union Building), Kenyon College, Gambier, Ohio
Northwestern University Group, Evanston
14 Sorority Buildings
2 Dormitories (with James Gamble Rogers)

Hamilton, Fellows & Nedved, Chicago
Cafeteria wing and Gymnasium, Evanston Township High School, Evanston
Beiger School, Mishawaka, Ind.
High School Building and Gymnasium, Albert Lea, Minn.

Hewitt, Emerson & Gregg, Peoria
Junior High School, Peoria
Columbia Elementary School, Peoria
Three Elementary Schools, Aurora

Charles Hodgdon & Son, Chicago
Group of seven buildings, University of Chicago, Chicago
Group of three buildings, St. Olaf College, Northfield, Minn.
Glenbard High School, Glen Ellyn

Holabird & Root, Chicago
Garrett Biblical Institute, Northwestern University, Evanston
University School for Girls, Chicago
Rosenwald Hall, University of Chicago, Chicago

Holmes & Flinn, Chicago
Severance Hall (dormitory), Carleton College, Northfield, Minn.
The McKinley Foundation at the University of Illinois, Champaign
Green Bay Road Elementary School, Highland Park

Horn & Sandberg, Rock Island
Edison School, Rock Island (by firm of Cervin, Horn & Stuhr, now dissolved)
Public School Stadium, Rock Island (partly executed by firm of Cervin, Horn & Stuhr, now dissolved)
Denkman School, Rock Island

Denison B. Hull & Stanley W. Hahn, Chicago
Tanner Library, Illinois College, Jacksonville
Baxter Hall, Illinois College, Jacksonville
Meadville Theological School, Chicago

Robert M. Hyde, Chicago
Abraham Lincoln School, Cicero
Midlothian Public School, Midlothian
Emerson Public School, Berwyn

William C. Jones Associates, Chicago
Elmhurst College (dormitories, library and class building) Elmhurst
Evangelical Orphanage and School, Bensonville
Kristian Public School, North Chicago

J. W. Kennedy, East St. Louis
Collinsville Township High School, Collinsville
Dupo Community High School, Dupo
Freeberg Community High School, Freeberg

Lewis & Dougherty, Chicago
Danville High School, Danville
West Chicago High School, West Chicago
J. H. Freeman Grade School, Aurora

Liese & Ludwick, Danville
Mayo Junior High School, Paris
Community High School, St. Joseph
Community High School, Tuscola

Jos. C. Llewellyn Co., Chicago
Lyons Township High School, La Grange
C. M. Bardwell School, Aurora
York Community High School, Elmhurst

Lundeen, Hooton, Roozen & Schaeffer, Bloomington
Presser Hall (Music School Building), Illinois Wesleyan University, Bloomington
Community High School, Normal
Horatio G. Bent Grade School, Bloomington

W. F. McCaughey, Park Ridge
Union Ridge School, District No. 86, Norwood Park Township, Chicago
Niles School addition, District No. 71, Niles
Des Plaines Grammar School, Des Plaines (John D. Chubb, Associate Architect)

Miller & Wallace, Inc., Chicago
Providence High School, Chicago
Health and Physical Education Group, Valparaiso University, Valparaiso, Ind.
Holy Cross Academy, Tucson, Ariz.

Benj. Franklin Olson, Chicago
Rearrangement of campus layout, Elmhurst College, Elmhurst
President's residence, Elmhurst College, Elmhurst
Gymnasium and Natatorium Building, Elmhurst College, Elmhurst

Raymond A. Orput, Rockford
High-Grade School, Waterman
Harlem High-Grade School, Love's Park, Rockford
Holcomb Grade School, Holcomb

Charles Pauly & Son, Granite City
George W. Niedringhaus School, Granite City
Marshall School, Granite City
Louis Baer School, Madison

Edgar A. Payne, Galesburg
Consolidated School, Winnebago
Community High School, Durand
Grade and High School, Paw Paw

Perkins, Chatten & Hammond, Chicago
Three Elementary Schools, Park Ridge
Logan Junior High School, Princeton
Willard School, River Forest

Peterson & Johnson, Rockford
Theodore Roosevelt Junior High School, Rockford
Abraham Lincoln Junior High School, Rockford
Marengo Community High School, Marengo

L. Pfeiffenberger's Sons, Alton
Alton High School, Alton (Associate Architects with Roger, Danely & Smith)
Marquette High School, Alton
Rufus Easton Grade School, Alton

J. E. O. Pridmore, Chicago
Stickney School, Chicago
College Building, Observatory, Lyceum Building and College Theater, De Paul University, Chicago

George E. Ramey, Champaign
Newman Foundation, Champaign
Lottie Switzer School, Champaign (Berger & Kelley, Associated Architects)
South Side School, Champaign (Berger & Kelley, Associated Architects)

James B. Rezny & Adrian Rezny, Chicago
Assembly Hall and Gymnasium, Saints Cyril and Methodius School, Chicago
St. Marie of Celle Elementary School, Berwyn
Our Lady of the Mount Elementary School, Cicero

Herbert Hugh Riddle, Chicago
Dormitory, Chicago Theological Seminary, Chicago
Hilton Chapel, same
Library and Taylor Hall, same

E. E. Roberts & Elmer C. Roberts, Chicago
Lincoln School, Oak Park
Hawthorne School, Oak Park
Oak Park Baptist Community Center, Oak Park

O. W. Rubach, Belleville
Bunsen School, Belleville
Franklin School, Belleville
Washington School, Belleville

Monroe R. Sandel & Co., Chicago
Fournier Institute, Lemont
St. John Cantius School, Chicago

Schmidt, Garden & Erikson, Chicago
College of Pharmacy, University of Illinois, Chicago
St. Mary's Springs Academy for Girls, Fond du Lac, Wis.
Nurses Training School, St. Francis Hospital, Pittsburgh, Pa.

William H. Schulzke, Moline
Geneseo High School, Geneseo
Erie High School, Erie
John Deere Junior High School, Moline

John A. Scribbins, Chicago
Wallace Junior High School, Sterling
Lincoln Junior High School, Mendota
Libertyville Township High School, Libertyville

Shattuck & Layer, Chicago
Waukegan Junior High School, Waukegan
Washington Grade School, West Harvey
School of St. Thomas the Apostle, Chicago

Slupkowski & Piontek, Chicago
Rev. Francis Gordon Memorial (gymnasium and high school building), Chicago
Holy Trinity High School, Chicago
St. Francis Seminary and Monastery, Burlington, Wis.

N. S. Spencer & Son, Chicago
High School, Mt. Vernon, Ind.
Two High Schools, East St. Louis

Leo Strelka, Chicago
St. Hilary's Elementary School, Chicago
St. Eulalia's Elementary School, Maywood
St. Bronislava's Elementary School, Chicago

Leonard F. W. Stuebe, Danville
City High School, Kankakee
Grade and Junior High School, Savannah, Ga.
Tilton Grade School, Danville

John S. Van Bergen, Ravinia
Ravinia Auditorium and School, Highland Park
Braeside School, Highland Park
Chicago Junior School, Elgin

Charles L. Wallace, Joliet
St. Margaret's Grade School, Chicago
Immaculate Conception Grade School, Elmhurst
St. Clotilde's Grade School, Chicago

INDIANA

Austin & Shambleau, South Bend
James Whitcomb Riley Junior High School, South Bend
Senior High School addition to James Whitcomb Riley Junior High School, South Bend
James Madison Junior High and Elementary School, South Bend

Harry Philip Bartlett, Indianapolis
Roosevelt School, Kokomo
Grade School, Seymour
William Street School, Huntington

Carroll O. Beeson, Crawfordsville
Addition to Lebanon High School, Lebanon
Addition to Crawfordsville High School, Crawfordsville
Addition to Darlington School, Darlington

Leighton Bowers, Fort Wayne
Churubusco High School, Churubusco
School Administration Building, Fort Wayne
Oxford Grade School, Fort Wayne

Harry E. Boyle & Co., Evansville
High School, Paoli
High School, Pinckneyville
High School, Hardinsburg, Ky.

Le Roy Bradley, Fort Wayne
Bourbon Consolidated School, Bourbon
Johnson Township High School, Wolcottville
Union Township School, Culver

Everett I. Brown, Fort Wayne
Montpelier Junior High School, Montpelier
P. A. Allen High School, Bluffton
Syracuse High School, Syracuse

Charles H. Byfield, Indianapolis
Grade School No. 85, Indianapolis
Centre Township Grade School No. 3, Indianapolis
District School No. 15, Bridgeport

Robert Frost Daggett, Indianapolis
Asbury Hall (Recitation Building) De Pauw University, Greencastle
Chemistry Building, Indiana University, Bloomington
Butler University Group, Indianapolis (Thomas Hibben, Associate Architect)

Willard M. Ellwood, South Bend
High School, Crisman
Junior High School remodeled, South Bend
Boys' Vocational School, South Bend

Fowler & Karges, Evansville
Lincoln High School, Evansville
Henry Ries Grade School, Evansville
St. Vincent School and Orphanage, Vincennes

Freyermuth & Maurer, South Bend
Benjamin Harrison School, South Bend
Abraham Lincoln School, Peru
Greene Township School, St. Joseph County

J. W. Gaddis, Vincennes
High School, Oaktown
High School, Sandborn
Grade and High School, Allendale, Ill.

Griffith & Goodrich, Fort Wayne
Elmhurst School, near Fort Wayne
Hillcrest School, near Fort Wayne
Cleveland Township School, South Whitley

Alfred Grindle, Bloomington
Bloomington High School extension, Bloomington
Elms Heights Grade School, Bloomington
D. Eckley Hunter Grade School, Bloomington

Harrison & Turnock, Indianapolis
Indiana School for the Blind, Indianapolis
Carpenter Hall, Earlham College, Richmond
Crispus Attucks High School, Indianapolis

Henkel & Hanson, Connersville
Mentone Grade and High School, Mentone
Madison High School, Madison
North Manchester Grade School, North Manchester

Norman H. Hill, Indianapolis
Union Township Consolidated School, Johnson County
Taylorsville Consolidated School, Taylorsville
Wayne Township Consolidated School, Hamilton County

O. L. Hill, Bedford
Burris School addition, Mitchell
Ellettsville High School, Ellettsville
Fayetteville High School, Fayetteville

McGuire & Shook, Indianapolis
Perry Township School, Indianapolis
School No. 80, Indianapolis
Sheridan Schools, Sheridan

Miller & Yeager, Terre Haute
Woodrow Wilson Junior High School, Terre Haute
Girls' Dormitory, Indiana State Teachers College, Terre Haute
Gymnasium Building, Indiana State Teachers College, Terre Haute

Callix E. Miller, South Bend
Holy Cross School, South Bend
Chapel, St. Mary's College, Notre Dame
St. Mary's School, Niles, Mich.

Hubert Miller, Elkhart
Lincoln School, Elkhart
Parkside School, Goshen
Hawthorne School, Elkhart

Karl D. Norris, East Chicago
Roosevelt Junior High School, East Chicago
Lincoln Grade School, Indiana Harbor
La Grange Grade School, La Grange

Wm. Gregory Rammel, Logansport
James Whitcomb Riley Junior High School Group, Logansport
Washington Township Grade and High School, Logansport
Argos High School, Argos

Frank P. Riedel, Lafayette
Longlois Grade School, Lafayette
St. Ann's Parochial Grade School, Lafayette
Beech Grove Grade School, Beech Grove

Walter Scholer, Lafayette
Purdue Campus, West Lafayette
West Lafayette Grade School, West Lafayette
Portland High School, Portland

Robert W. Stevens, Huntington
St. Felix Capuchin Monastery, Huntington
Central Grade School, Huntington
Dallas Township Consolidated School, Andrews

Geo. J. Stoner & Co., Terre Haute
Glenn High School, East Glenn
North Terre Haute High School, North Terre Haute
Concannon High School, West Terre Haute

Sutton & Routt, Vincennes
St. Mary's School, Washington
Vincennes Gymnasium and Coliseum, Vincennes
Grade School and Gymnasium, Mt. Carmel

Charles L. Troutman, Evansville
Carpenter Grade School, Evansville
Benjamin Bosse High School, Evansville
Tell City High School, Tell City

Wainwright, Wilkins & Co, Hammond
Technical High School, Hammond
Elementary School, Westmont, Ill.
Senior High School Group, Hobart

E. R. Watkins, Anderson
The Longfellow School, Anderson
Anderson High School Gymnasium, Anderson
Otterbein College Gymnasium, Westerville

Werking & Son, Richmond
High School, Mays
High School, Milan
High School, Cutler

Joe H. Wildermuth & Co., Gary
Tolleston Primary School, Gary
Public Schools Memorial Auditorium, Gary
Milford High School, Milford, Ill.

IOWA

Charles Altfillisch, Decorah
C. K. Preus Gymnasium, Luther College, Decorah
Theta Xi Fraternity House, Iowa City
High School additions, Decorah

Beuttler & Arnold, Sioux City
East Senior High School, Sioux City
High School, Onawa
Public School, Alcester, S. Dak.

Clausen, Kruse & Klein, Davenport
Garfield Elementary School, Davenport
St. Paul's Parochial School, Davenport
Administration Building, Gymnasium, Boiler House for Board of Education, Davenport

Mortimer B. Cleveland, Waterloo
Hawthorne School, Waterloo
Gymnasium, Upper Iowa University, Fayette
Gymnasium, Fletcher College, Oskaloosa

E. O. Damon, Jr., Fort Dodge
St. Mary's School and Convent, Mallard
St. Cecilia's School, Algona
Kamrar High and Grade School, Kamrar

Dougher, Rich & Woodburn, Des Moines
Jefferson Grade School, Muscatine
Oakland High and Grade School, Oakland
Carson Memorial High School, Marengo

Arthur H. Ebeling, Davenport
Maquoketa High School, Maquoketa
Davis Hall, St. Ambrose College, Davenport
Lewis Science Hall, St. Ambrose College, Davenport

Frank W. Griffith, Fort Dodge
Wahkonsa Grade School, Fort Dodge
Duncombe Grade School, Fort Dodge
Butler Grade School, Fort Dodge

J. Chris Jensen, Council Bluffs
Bloomer School, Council Bluffs
Dana College, Blair, Nebr.
Franklin School, Council Bluffs

Keffer & Jones, Des Moines
Creston High School, Creston
Junior High School, Estherville
Storm Lake High School, Storm Lake

Raymond F. Moore, Cedar Rapids
High and Grade School, Stronghurst, Ill.
High and Grade School, Ackley
High School, Wayland

Harry E. Reimer, Marshalltown
Garwin High School, Garwin
High School, State Center
High School, Newburg

J. F. Reynolds, Sioux City
Rushville High School, Rushville, Nebr.
Salix High School, Salix
Sargent High School, Sargent, Nebr.

Charles L. Ritts, Burlington
Oak Street Junior High School, Burlington
Addition to Prospect Hill School, Burlington
High School addition, Burlington

George A. Spooner, Council Bluffs
Gymnasium, Abraham Lincoln High School, Council Bluffs
Underwood Consolidated School, Underwood
Sigma Nu Fraternity House, Lincoln, Nebr.

John C. Wood, A. H. Morrell, Associate Architects, Clinton
Grade School, Clinton
High and Grade School, Camanche
High and Grade School, Andrew

Charles B. Zalesky, Cedar Rapids
McKinley High School, Cedar Rapids
Mt. Marcey Academy, Cedar Rapids
St. Patrick's School, Cedar Rapids

KANSAS

Ellis Charles, Wichita
Williard Elementary School, Wichita
Ingalls Elementary School, Wichita
Washington Elementary School, Anthony

Cuthbert & Suehrk, Topeka
Gage Park Grade School, Topeka
Auditorium, Kansas University, Lawrence
Teachers Training School, Emporia

Harry C. Eckland, Kansas City
Iowa Wesleyan College Group, Mt. Pleasant, Ia.
Bethany College Group, Lindsborg
High School, Muscatine, Ia.

Smith & English, Hutchinson
Rural High School, Downs
Grade School, Oxford
Rural High School, Minneola

Glen H. Thomas, Wichita
Wichita High School North, Wichita
Senior High School, Coffeyville
Longfellow Elementary School, Wichita

S. S. Voigt, Wichita
High School, Belleville
High School, Lakin
High School, Lost Springs

Thos. W. Williamson & Co., Topeka
Central High School, Topeka
Science Hall, Baker University, Baldwin
Field House, Washburn College, Topeka

KENTUCKY

H. A. Churchill & John T. Gillig, Lexington
Gymnasium, Kentucky Wesleyan College, Winchester
Boys' and Girls' Dormitories, Lees Collegiate Institute, Jackson
Hughes Memorial Auditorium, Asbury College, Wilmore

J. Meyrick Colley, Louisville
Western High School for Girls, Louisville
Group of six Junior High Schools, Louisville
Virginia Avenue Elementary School, Louisville

O. W. Holmes, Louisville
Mt. Tabor Grade School, New Albany Township, Floyd County, Ind.
Ohio Falls Grade School, Clarksville, Ind.
Okolona High School, Okolona

C. W. Kimberlin, Owensboro
Daviess County High School, Owensboro
McHenry Grade and High School, McHenry
Nortonville Consolidated School, Nortonville

Albert F. Klein, Ashland
William C. Condit Grade School, Ashland
John F. Hager Grade School, Ashland
Booker T. Washington Grade School, Ashland

D. X. Murphy and Brother, Louisville
Nine buildings remodeled for the University of Louisville, Louisville
Anchorage Graded School, Anchorage
St. Brigid Parochial School, Louisville

Thomas J. Nolan, Louisville
St. Cecilia's Parochial Grade School, Louisville
Christ the King Parochial Grade School, Louisville
St. Francis of Rome Parochial Grade School, Louisville

Leo L. Oberwarth & Sons, Frankfort
High School and Auditorium, Frankfort
Auditorium and School Building, Institute for Backward Children, Frankfort
Consolidated School, Bagdad

G. Tandy Smith, Jr., Paducah
Group of four buildings, Murray State Teachers College, Murray
Andrew Jackson Grade School, Paducah
Grade School, Princeton

Arthur G. Tafel, Louisville
Additions and Gymnasium, Dupont Manual Training High School, Louisville
Evangelical Lutheran School, Louisville
Fern Creek School and Gymnasium, Fern Creek

John T. Waller, Hopkinsville
Bethel Woman's College, Hopkinsville
High School Gymnasium, Hopkinsville
High School, Calhoun

LOUISIANA

William R. Burk, New Orleans
Joseph Maumus School, Arabi
Hope Haven Agricultural and Mechanical School, Marrero
Leon Godchaux High School, Reserve

E. A. Christy, New Orleans
Charles J. Colton School, New Orleans
Martin Behrman School, New Orleans
Alcee Fortier Boys High School, New Orleans

Herman J. Duncan, Alexandria
Franklinton High School, Franklinton
Lawtell School, Lawtell
Calvin School, Calvin

Edward F. Neild, Shreveport
Two High Schools and one Grammar School, Shreveport
One High School, Haynesville
High School, Homer

William T. Nolan, New Orleans
Baton Rouge Senior High School, Baton Rouge
Elton Group, one High School, one Elementary School, Elton
State School for the Deaf, Baton Rouge

Theodore L. Perrier, New Orleans
Eighth Ward School, Jefferson Parish
St. Catherine of Sienna Parochial School, Metairie Ridge
Crossman Annex, New Orleans

Martin Shepard, New Orleans
St. Matthias Parochial School, New Orleans
Novitiate Convent, Lafayette
High School addition, Pascagoula, Miss.

Wogan and Bernard, New Orleans
Jesuit High School Group, New Orleans
Louisiana State University Group, Baton Rouge
Bernard Terrace School, Baton Rouge

C. Scott Yeager, Alexandria
Orange High School, Leesville, Vernon Parish
Pollock High School, Pollock, Grant Parish
Dry Prong High School, Dry Prong, Grant Parish

MAINE

Bunker & Savage, Augusta
Winslow High School, Winslow
Bath High School, Bath
Rockland High School, Rockland

Harry S. Coombs, Lewiston
Lewiston High School, Lewiston
Skowhegan High School, Skowhegan
M. C. I. Institute, Pittsfield

Crowell & Lancaster, Bangor
Mary S. Snow Grade School, Bangor
Group of four buildings, University of Maine, Orono
High School Building, Good Will Home Association, Hickley

Miller & Beal, Inc., Portland
Edward Little High School, Auburn
North Yarmouth Academy, Yarmouth
Lawrence High School, Fairfield

John Calvin Stevens & John Howard Stevens, Portland
Kelsey Street Primary School, South Portland
Pine Street Primary School, South Portland
Fryeburg Academy, Fryeburg

MARYLAND

C. M. Anderson, Baltimore
Baltimore Polytechnic Institute, Baltimore
Dining Hall and Science Building, Western Maryland College, Westminster
McDaniel Hall (girls' dormitory), Western Maryland College, Westminster

Frank J. Baldwin, Baltimore
Mt. St. Mary's College, Emmetsburg
College of Notre Dame of Maryland, Baltimore
Mt. St. Agnes' College, Mt. Washington

William W. Emmart, Baltimore
Gymnasium, Dickinson College, Carlisle, Pa.
Administration Building, St. Charles College, Baltimore
Northeast Junior High School, Baltimore

W. H. Emory, Jr., Baltimore
Ellicott City High School, Ellicott City (associated with I. W. Pietsch)
West Friendship School, West Friendship (associated with I. W. Pietsch)
McDonogh School, McDonogh (associated with Smith & May)

Clyde N. Friz & Nelson Friz, Baltimore
Windsor Hills School, Baltimore
Hamilton School, Baltimore
Arlington School, Baltimore

Robert Harris, Baltimore
Curtis Bay Vocational School, Baltimore
Elementary School, St. Mary's County
Mechanicsville High School, Mechanicsville

A. A. Hileman, Frederick
Maryland Park High School, Prince George's County
Maryland State School for the Deaf, Frederick
High School, Friendsville, Garrett County

Henry Powell Hopkins, Baltimore
Cambridge High School, Cambridge
Maryland Training School for Boys, Loch Raven
Easton High School, Easton

Herbert G. Jory, Baltimore
Elementary School, Baltimore
Nurses Home and Training School, South Baltimore General Hospital, Baltimore
Highlandtown School, Baltimore

Hugh I. Kavanagh, Baltimore
St. Mary's Industrial School, Baltimore
St. John's School, Frederick
Little Flower School, Baltimore

A. J. Klinkhart, Hagerstown
Hagerstown High School, Hagerstown
Fairview Avenue Grade School, Waynesboro, Pa.
Clearspring High School, Clearspring

Smith & May, Baltimore
Gwynns Falls Park High School, Baltimore
Entire group, Maryland State Normal School, Salisbury
Forty-five school buildings (total in county), Baltimore County

Upjohn & Glidden, Baltimore
Public School No. 84, Baltimore
Girls' Latin School, Baltimore
St. Catherine's School for Girls, Richmond, Va.

MASSACHUSETTS

Adden & Parker, Boston
Beverly High School, Beverly
Reading Junior High School, Reading
Manter Hall School, Cambridge (Charles H. Way, Associate Architect)

Allen & Collens, Boston (also New York City)
Union Theological Seminary, New York City
Hartford Theological Seminary, Hartford, Conn.
Chapel, Dormitory, Infirmary, Williams College, Williamstown, Mass.

James E. Allen, Lawrence
Lawrence High School, Lawrence
Francis Leahy Elementary School, Lawrence
George W. Brown Elementary School, Newburyport

J. W. Ames & E. S. Dodge, Boston
Dormitories, Smith College
Gymnasium, Smith College
Kingswood School, West Hartford, Conn.

Andrews, Jones, Biscoe & Whitmore, Boston
Crane Theological School, Tufts College, Medford
Dormitory Group, The Masters School, Dobbs Ferry, N. Y.
The Sheridan School, Salem

Ashton, Huntress & Alter, Lawrence
Junior High School, Portsmouth, N. H.
James F. Leonard Elementary School, Lawrence
Central Junior High School, Methuen

Elmer Smith Bailey, Boston
Layout of William E. Nickerson Recreation Field: Stadium, Field Houses, Football Dormitory, Boat House, etc., Boston University, Boston
School program for Sanford, Me.: Edison and Lincoln Schools and addition to the High School
School program for Manchester, N. H.: Practical Arts High School, West Side High School, and Franklin Grade School

D. R. Baribault, Springfield
St. Joseph's School, Springfield
Notre Dame School, Holyoke
St. Vital School, Fort Garry

J. Williams Beal, Sons, Boston
Whitman High School, Whitman
Rockland Junior-Senior High School, Rockland
Hanover Junior-Senior High School, Hanover

William H. Brainerd Associates, Boston
Selden L. Brown School, Wellesley
Six Grade High School, Peterborough, N. H.
Junior High School, Winthrop

L. W. Briggs Co., Worcester
South High School Gymnasium and Classroom Building, Worcester
Auburn Elementary School, Auburn
Addition to Worcester Boys' Trade School, Worcester

Edwin T. Chapin, Worcester
Addition to Ledge Street School, Worcester
Addition to Farmersville School, Grafton
Lee Street School, Worcester

Office of William Chapman, Boston
Daniel Webster Junior High School, Quincy Point
Adams Shore School, Adams Shore
Merrymount School, Merrymount, Quincy

Coolidge & Carlson, Boston
Indoor Playing Field, Gymnasium and Locker Buildings, Bates College, Lewiston, Me.
Classroom Building and Recreation Building, Girls' School, Berry Schools, Mount Berry, Ga.
Dormitory, Laboratories and Aeronautical Building, Massachusetts Institute of Technology, Cambridge

Coolidge, Shepley, Bulfinch & Abbott, Boston
Chemical Laboratories, Harvard University, Cambridge
Lowell House and Dunster House, Harvard University, Cambridge
University of Virginia Medical School and Hospital, Charlottesville, Va.

Frank Irving Cooper Corp., Boston
Somerville High School, Somerville
North Junior High School, Quincy
Franklin Junior High School, Norwalk

Edward M. Corbett, Fall River
Technical High School, Fall River
Warren High School, Warren, R. I.
Hebronville School, Attleboro

George A. Cornet, Lynn
Lynn English High School, Lynn
Eastern Junior High School, Lynn
Lynn Trade School, Lynn

Cram and Ferguson, Boston
Chapel, Princeton University, Princeton, N. J.
Three dormitories, Phillips Exeter Academy, Exeter, N. H.
Chapel, St. George's School, Newport, R. I.

Cutting, Carleton & Cutting, Worcester
May Street School, Worcester
Sycamore Street Continuation School addition, Worcester
Lincoln Street School, Worcester

Derby, Barnes & Champney, Boston
Hingham High School, Hingham
George Washington Elementary School, Winchester
Bedford Junior High School, Bedford

Alfred O. Dion, Brookline
St. Athanasius School, Rumford, Me.
St. Therese School, Mexico, Me.
Marshfield Junior High School, Marshfield

Ralph Harrington Doane, Boston
Abraham Lincoln School, Braintree
Sharon High School, Sharon
Braintree Highlands School, Braintree

John William Donahue, Springfield
Providence College, Providence, R. I.
Our Lady of The Elms, College and Academy Buildings, Chicopee
LaSalle Academy, Providence, R. I.

Joseph J. Driscoll, Boston
Continuation School, Boston
Library, St. John's Seminary, Brighton
Champlain Elementary School, Boston

William W. Drummey, Inc., Boston
William McKinley School, Revere
Lafayette School, Everett
Beethoven School (First Standard School), Boston

M. A. Dyer Co., Boston
Municipal Group, Webster: Town Office Building, Senior High School, Junior High School, and Auditorium (one building)
Leominster Junior High School, Leominster
Milton F. Roberts Junior High School, Medford

George H. Fugere & Son, Chicopee Falls
Michael A. Kirby Junior High School, Chicopee
St. George School, Chicopee
Patrick A. Bowe School, Chicopee

E. C. & G. C. Gardner, Springfield
Dormitory and Campus Group, International Y. M. C. A. College, Springfield
Chestnut Street School, Springfield
Junior High School, Stafford Springs, Conn.

Edward T. P. Graham, Boston (also Cleveland, Ohio)
Our Lady Help of Christians School, Newton
Abraham Lincoln School, Cambridge
Cathedral High School, Boston

Malcolm B. Harding, Westfield
Longmeadow Center School, Longmeadow
High School, Westfield
Consolidated Grade School, Southwick

Hartwell & Richardson, Boston
Springfield High School, Springfield
Newton High School, Newton
Cambridge Latin School, Cambridge

Haven & Hoyt, Boston
Newton Central High School, Newton
New England Conservatory of Music, Boston
Salem Hospital Training School Home for Nurses, Salem

Haynes & Mason, Fitchburg
High School, Springfield, Vt.
Consolidated School, Vineyard Haven
Grade School, Milford, Conn.

Henry & Richmond, Boston
John Wingate Weeks High School, Newton Center
Massachusetts School of Art, Boston
Samuel Phillips Recitation Hall and Morse Laboratory of Chemistry, Physics and Biology, Phillips Academy, Andover

Hutchins & French, Boston
Henry Whittemore Grade School, Waltham
Group of buildings, Tilton School, Tilton, N. H.
High School, South Berwick, Me.

Paul Beekman Johnson, Springfield
High School addition, Agawam
North Agawam School addition, Agawam
Springfield Street School addition, Agawam

Kilham, Hopkins & Greeley, Boston
Wentworth Institute, Boston
Woburn High School, Woburn
Charles J. Emerson School, Stoneham

J. D. Leland & Company, Boston
Junior High School, Worcester
Junior High School, Fitchburg
Browne School, Watertown

Morris W. Maloney, Springfield
Elias Brookings School, Springfield
Samuel Bowles School, Springfield
Robert O. Morris School, Springfield

McLaughlin & Burr, Boston
Agassiz-Bowditch District Intermediate School, Boston
Henry Wadsworth Longfellow Intermediate School, Cambridge
Grade School No. 6, Port Washington, N. Y.

Harry L. Meacham Associates
Junior High School, Shrewsbury
Grade School, Swansea
High School, Marlboro, N. H.

Morse & Dickinson, Boston
Two buildings, J. C. Tilton School, Haverhill
Physical Education Buildings, Massachusetts State College, Amherst

Mulhall & Holmes Co., Boston
Ralph Waldo Emerson School, Boston
Charles Logue Elementary School, Boston
Milford Elementary School, Milford

O. E. Nault & Son, Worcester
Assumption College, Worcester
St. Ann's Academy, Marboro
Holy Rosary School, Gardner

Perry, Shaw & Hepburn, Boston
New group for Radcliffe College, Cambridge
Dexter School, Brookline
College of William and Mary, Williamsburg, Va.

James H. Ritchie & Associates, Boston
Massachusetts Agricultural College Group, Amherst
High School, Westboro
John Ward School, Newton

Jasper Rustigian, Worcester
Nelson Place School, Worcester
Bloomingdale Road School No. 2, Worcester
Middlesex Avenue School, Worcester

Sanborn & Weed, Lynn
Eastern Senior High School, Lynn
Home-Making School for Girls, Essex County Agricultural School, Hathorne
Cobbett Elementary School and Administration Building (for School Department), Lynn

Strickland, Blodget & Law, Boston
University of Beirut, Syria
Dormitory for Middlesex School, Concord
University of Maine, Orono, Maine

Office of R. Clipston Sturgis, Boston
Needham High School, Needham
Lawrence School, Brookline
Sudbury School, Sudbury

Matthew Sullivan, Boston
Refectory Building, St. John's Preparatory School, Danvers
St. Thomas' High School, Jamaica Plain, Boston
Our Lady of Grace School, Everett

William Tallman, New Bedford
Roosevelt Junior High School, New Bedford
Addition to The Fairhaven High School (Rogers Memorial) Fairhaven
South Elementary School, Nantucket

Walker, Walker & Kingsbury, Boston
Washington Irving School, Boston
Washington School, Boston
Michelangelo School, Boston

Edward I. Wilson, Boston
Second unit, Revere Senior-Junior High School, Revere
James A. Garfield Junior High School, Revere
Elementary School, Washington-Allston District, Boston

MICHIGAN

Samuel C. Allen, Saginaw
Clio High School, Clio
Lasalle High School, St. Ignace
Carman School, Flint

George J. Bachmann, Flint
Kearsley School, Flint
Bendle School, Flint
Herbert Hoover School, Flint

Ernest S. Batterson, Kalamazoo
High School, Zeeland
Union School, Centreville
Woodrow Wilson School, Kalamazoo

Billingham & Cobb, Kalamazoo
Dowagiac High and Grade School, Dowagiac
Central High School, South Haven
Harding Grade School, Kalamazoo

J. Vanden Bogert, Grand Rapids
Oakleigh School, Grand Rapids
Hudsonville School, Hudsonville
Woodworth School, Grand Rapids

J. N. Churchhill, Lansing
Walter H. French Junior High School, Lansing
Eastern High School, Lansing
Henry R. Pattengill Junior High School, Lansing

Colton & Knecht, Grand Rapids
St. Thomas' School and Chapel, Grand Rapids
Gymnasium, St. Andrew's Cathedral Parish High School, Grand Rapids
St. Isidore's School, Grand Rapids

Cowles & Mutscheller, Saginaw
School and Auditorium, Swartz Creek
Kinney School, Mt. Pleasant
Daniel Axford Grade School and Auditorium, Oxford

J. Ivan Dise, Detroit
Alexander Hamilton School, Detroit
Christopher Columbus School, Detroit
Stevens T. Mason School, Detroit

Donaldson & Meier, Detroit
Sacred Heart Seminary Group, Roman Catholic Diocese of Detroit
Thomas M. Cooley High School, same
Elizabeth Cleveland Intermediate School (for Board of Education), Detroit

A. H. Ellwood & Son, Kalamazoo
Ligonier High School, Ligonier, Ind.
Hamilton High School, Hamilton, Ind.
Lawrence High School, Lawrence

Frank S. Forster, Muskegon
Junior and Senior High School, Big Rapids
Elementary and Junior High School, Muskegon Heights
Froebel Elementary School, Muskegon

R. V. Gay, St. Johns
Rogers City High School, Rogers City
Carpenter Street Grade School, Midland
McBain High School, McBain

R. S. Gerganoff, Ypsilanti
Ypsilanti High School addition, Ypsilanti
High School, Gymnasium, Ypsilanti
Woodruff School addition, Ypsilanti

Joseph C. Goddeyne, Bay City
Immanuel Lutheran School, Bay City
Washington School, Bay City
Woodside School, Bay City

Aaron H. Gould & Son, Detroit
New group of buildings, Wayne County Training School, Northville
Juvenile Detention School, Detroit
Clara B. Arthur School, Detroit

George J. Haas, Detroit
Grosse Pointe High School, Grosse Pointe
Lakeview High School, Ste. Claire Shores
South Lake High School, Lake Township

Homer Harper, Benton Harbor
Morton School, Benton Harbor
Bard School, Benton Harbor
Lakeside School, Lakeside

Warren S. Holmes Co., Lansing
National Kindergarten and Elementary College, Evansville, Ill.
New Britain High School, New Britain, Conn.
Marshall High School, Marshall

Austin Alonzo Howe, Detroit
Jared W. Finney School, Detroit
Frederick William Von Steuben School, Detroit
Anthony Wayne School, Detroit

Derrick Hubert, Menominee
Engineering Building, Michigan College of Mining and Technology, Houghton
Ontonagon High School, Ontonagon
St. Joseph's Grade-High School and Convent, Lake Linden

Louis Kamper, Inc., Detroit
Henry Philip Tappan Intermediate School, Detroit
Frederick William Higgins Elementary School, Detroit
John F. Bennett School addition and Power House, Detroit

Hugh T. Keyes, Detroit
Calvin Coolidge Junior High School, Ferndale
Taft School, Ferndale
Jefferson School, Ferndale

Lane, Davenport & Bennett, Detroit
Ferris Institute, Big Rapids
Clark High School, Clarkston
Wever School, Pontiac

LeRoy & Newlander, Kalamazoo
Central High School, Kalamazoo
Slocum Truax High School, Trenton
High School, Lapeer

Frederick D. Madison, Royal Oak
1927 Royal Oak High School and All-Grade School, Royal Oak
Barnum School, Birmingham
Lapham School, Allen Park

Malcomson & Higginbotham & Trout—A. W. Balle, Associate, Detroit
Women's Dormitory, University of Michigan, Ann Arbor
University of Detroit High School and Faculty Building, University of Detroit, Detroit
University Elementary School, University of Michigan, Ann Arbor

George D. Mason & Co., Detroit
Thomas A. Edison School, Dearborn
Gabriel Richards School, Detroit
U. S. Grant School, Detroit

McGrath & Dohmen, Detroit
Annie Lathrup School, Birmingham
John Marshall School, Detroit
John A. Logan School, Detroit

Harry L. Mead, Grand Rapids
St. Adalbert's Grade School, Grand Rapids
St. Philip's High School, Battle Creek
Emerson Grade School, Ionia

F. E. Parmelee, Iron Mountain
L'Anse High School, L'Anse
Iron Mountain Junior High School, Iron Mountain
Kingsford High School, Kingsford

Robinson & Campau, Grand Rapids
High School, East Grand Rapids
Grade School, Holland
Seminary, Calvin College, Grand Rapids

Lewis J. Sarvis, Battle Creek
Battle Creek College Library, Battle Creek
Fremont School, Battle Creek
Southwestern Junior High School, Battle Creek (J. D. Chubb, Collaborating Architect)

Smith, Hinchman & Grylls, Detroit
John J. Pershing High School, Detroit
Edwin Denby High School, Detroit
Nolan Intermediate School, Detroit

N. Chester Sorensen, Detroit
Charles E. Chadsey High School, Detroit
Alexander Macomb Elementary School, Detroit
John J. Bagley Elementary School, Detroit

Howell Taylor, Detroit
Three grade schools, Adrian
Gymnasium, Adrian College, Adrian

Henry H. Turner, Grand Rapids
Burton Junior High and Elementary School, Grand Rapids
Nelson Elementary and Crippled Children's School, Muskegon
Escanaba Junior High School, Escanaba

B. C. Wetzel & Co., Detroit
Copernicus Junior High School, Hamtramck
Andrew Jackson Junior High School, Detroit
Washington Elementary School, Wyandotte

Albert Wood, Jr., Detroit
James Gardner Grade School, Detroit
Davy Street Grade School, Detroit
Beech Street Grade School, Dearborn

Walter H. Wyeth, Port Huron
Roosevelt Junior High School, Port Huron
Armada High School, Armada
St. Augustine Parochial School, Richmond

MINNESOTA

W. L. Alban, St. Paul
High and Grade School, Cumberland, Wis.
High School, Blair, Wis.
Lincoln Grade School, Alice Lake, Wis.

Boyum, Schubert & Sorenson, Winona
Central Grade School, Winona
Madison Grade School, Winona
St. Martin's Lutheran School, Winona

Croft & Boerner, Minneapolis
Washington Park High School, Racine, Wis.
Junior-Senior High School, Brainerd
Junior-Senior High School, Ironwood, Mich.

W. R. Dennis, Minneapolis
Addition to Fergus Falls High School, Fergus Falls
Addition to Park Region College, Fergus Falls
Grade and High School, Kelliher

Nairne W. Fisher, St. Cloud (also Dubuque, Iowa)
Clarke College, Dubuque, Iowa
Garfield School, St. Cloud
Mundelien College, Chicago, Ill.

Le Roy Gaarder, Albert Lea
Consolidated Grade and High Schools, Freeborn
Consolidated Grade and High Schools, Alden
New Grade School additions, Albert Lea

F. H. Hafey, Minneapolis
John Marshall High School (for Board of Education), Minneapolis
Washburn Junior High School, same
Maria Sanford Junior High School, same

Hewitt & Brown, Inc., Minneapolis
Dunwoody Institute Group, Minneapolis
Blake School Group, Hopkins
Wayzata Consolidated School, Wayzata

William M. Ingemann, St. Paul
Macalester College Group, St. Paul (Associate Architect)
Dormitory, Gustavus Adolphus College, St. Peter
New group of dormitory buildings (designs and floor plans), University of Minnesota, Minneapolis

Jacobson & Jacobson, Minneapolis
Wahpeton School, Wahpeton, N. Dak.
Litchfield School, Litchfield
Anoka School, Anoka

C. H. Johnston, St. Paul
Dormitory for Men, University of Minnesota, Minneapolis
Cyrus Northrup Memorial Auditorium, University of Minnesota, Minneapolis
Physical Education Buildings, State Farm Schools, Morris and Crookston

B. J. Knowles, Winona
High School Auditorium-Gymnasium, Winona (associated with Wm. B. Ittner, Inc., St. Louis, Mo.)
St. Thomas Parochial School, Winona
St. Mary's Parochial School, Fountain City

Lang, Raugland & Lewis, Minneapolis (also St. Paul)
New group of buildings, Luther Theological Seminary, St. Paul
School and Dormitory Building, Lutheran Bible Institute, Minneapolis
Grade School for Common School District No. 21, Golden Valley, Hennepin County

Long & Thorshov, Inc., Minneapolis
Concordia College Group, St. Paul, new Campus layout, new Administration Building: Dormitory, and Refectory
Northwestern Bible School, Minneapolis

P. M. Olsen, Duluth
Junior High School, St. Cloud
Cotton High School, Cotton
Meadowlands School, Meadowlands

Geo. Pass & Son, & P. T. Rockey, Mankato
Franklin Grade and Junior High School, Mankato
Grade School, Fairmont
High School, Blue Earth

Louis C. Pinault, St. Cloud
Grade and High School, Cold Spring
Grade School, St. Joseph
Grade School, Wahpeton, N. Dak.

Albert G. Plagens, New Ulm
St. Anne's Parochial School, Wabasso
Boys' Dormitory, Dr. Martin Luther College, New Ulm
Community Building and High School Gymnasium, Glencoe

Frederick A. Schweiger, Moose Lake
High School, Moose Lake
Consolidated School Building, Willow River
Consolidated School Building, Kettle River

C. H. Smith, Duluth
Washburn Grade School, Duluth
Congdon Park Grade School, Duluth
Lincoln Junior High School addition, Duluth

Stebbins, Haxby & Bissell, Minneapolis
Excelsior Junior-Senior High School, Excelsior
High-Grade School, Alexandria (Ekman-Holm & Co., Associate Architects)
Gymnasium-Auditorium, Cannon Falls (Ekman-Holm & Co., Associate Architects)

Sund & Dunham, Minneapolis
Detroit Lakes High School, Detroit Lakes
Howard Lake Grade and High School, Howard Lake
Edina Elementary School, Minneapolis

J. C. Taylor, Hibbing
Brooklyn Grade School, Hibbing
Parochial Junior High School, Hibbing
Cherry High School, Cherry

Toltz, King & Day, Inc., St. Paul
Dr. Martin Luther College Group, New Ulm
Grade and High School Buildings, South St. Paul
High School, New Prague

MISSISSIPPI

Harry North Austin, Jackson
Library, Millsaps College, Jackson
Science Building, Millsaps College, Jackson
Women's Building, Millsaps College, Jackson

Frank P. Gates Co., Jackson
School of Education and Demonstration High School, University of Mississippi
Graduate School Building, University of Mississippi
Law School Building, University of Mississippi

Hull & Mulvaney, Jackson
Newton High School, Newton
Cleveland High School, Cleveland
Copiah-Lincoln Junior College Buildings, Wesson

P. J. Krouse, Meridian
High School Building, Natchez
M. S. C. W. Group, Columbus: Dormitory, Dining Hall, Physical Education, Administration
High School, Clarksdale

C. H. Lindsley, Jackson
Home Economics and Hygiene Building, Mississippi State College for Women, Columbus
Agricultural Experiment Station, Agricultural and Mechanical College, Starkville
Administration Building, Delta State Teachers College, Cleveland

Wilfred S. Lockyer, Picayune
New group of buildings, Harrison-Stone-Jackson Agricultural High School and Junior College, Perkinson, Miss.: Auditorium, Science Department, Boys' Dormitory, Girls' Dormitory, Gymnasium, Power House, new dining-room and modern kitchen.

N. W Overstreet, Jackson
E. E. Bass Junior High School, Greenville
Booneville High School, Booneville
Brooklyn Academic Building, Brooklyn

Shaw & Woleben, Gulfport
Central Elementary School, Gulfport
Long Beach School, Long Beach
Elementary School, Belzoni

Vinson B. Smith, Jr., Gulfport
Three buildings, Mississippi State Teachers College, Hattiesburg
Two buildings, Industrial Training School, Columbus

J. M. Spain, Jackson
Administration Building, Blue Mountain College, Blue Mountain
Houston School, Houston
Drew High School, Drew

W. A. Stanton, Vicksburg
Carr Junior High School, Vicksburg
Oak Ridge School, Warren County
All Saints College (dormitory and auditorium)

MISSOURI

Ludwig Abt, Moberly
East Park School, Moberly
Junior High School, Moberly
Junior College, Moberly

Bonsack & Pearce, Inc., St. Louis
Ozark Wesleyan College, Carthage
Hardin College Group, Mexico
High School, Bonne Terre

Ernest O. Brostrom, Kansas City
Rock Creek Rural School, Independence
Raytown High School, Raytown
Educational Building, Presbyterian Church, Fort Scott, Kans.

Maurice Carroll, Kansas City
St. Mary's College, Notre Dame, Ind.
Christian Brothers High School, St. Joseph
St. Mary's College, Leavenworth, Kans.

Eckel & Aldrich, St. Joseph
New Central High School, St. Joseph
Two buildings, Missouri State School, Marshall
Group of buildings, Palmer College, Albany

Ben C. Elliott, Mexico
Mexico Junior and Senior High School, Mexico
Bellflower High School, Bellflower
St. Brendan's School, Mexico

Felt, Dunham & Kriehn, Kansas City
South Junior High School, Joplin
Eugene Field School, Maryville
Administration and Chapel Building, Tarkio College, Tarkio

Ferrand & Fitch, St. Louis
Dormitory, Library, and Music Building, Drury College, Springfield
Senior High School, University City (collaborating with Trueblood & Graf)

Frederick C. Gunn, Kansas City
Training School for Nurses, General Hospital, Kansas City
Training School and Clinic No. 2 (colored), General Hospital, Kansas City
Headquarters Building, Church of the Nazarene, Kansas City

Heckenlively & Mark, Springfield
Bolivar High School, Bolivar
Walnut Grove High School, Walnut Grove
Consolidated High School, Anderson

Hellmuth & Hellmuth, St. Louis
Sacred Heart School, Chicago, Ill.
School of the Immaculate Heart, Normandy
School of the Little Flower, St. Louis County

Hoener, Baum & Froese, St. Louis
High School, Jennings
Church School, Cape Girardeau
High School, Owensville

Wm. B. Ittner, Inc., St. Louis
Junior High School, Pontiac, Mich.
Senior High School, Owosso, Mich.
Roosevelt School, Gary, Ind.

La Beaume & Klein, St. Louis
Library, Lindenwood College, St. Charles
Washington University School of Dentistry, St. Louis
Second Presbyterian Church Educational Building, St. Louis

Malcolm S. Martin, Hannibal
Knox College Library, Galesburg, Ill.
Laura J. Pettibone School, Hannibal
Eugene Field School, Hannibal

Eugene R. Meier, St. Joseph
Girls' Dormitory, N. W. Missouri State Teachers College, Maryville
Addition to Blair School, St. Joseph
Webster Elementary School, St. Joseph

O'Meara & Hills, St. Louis
(also Detroit, Mich.)
Cretin High School, St. Paul, Minn.
Villa Duchesne (Girls' School), St. Louis County, Mo.
St. Johns Seminary, Kansas City, Mo.

Owen, Sayler & Payson, Kansas City
High School, Excelsior Springs
High School, Olanthe, Kans.
Young Hall (dormitory), Missouri Valley College, Marshall

H. D. Pampel, Kansas City
North Kansas City High School, North Kansas City
Brookfield High and Grade School, Brookfield
Holton High School, Holton, Kans.

Reither & Lindsay, Cape Girardeau
Administration Building, Bethel College, McKenzie, Tenn.
High School, East Prairie
High School, Oran

Chas. A. Smith, Kansas City
Westport Junior High School, Kansas City
Administration and Chapel Building, William Jewell College, Liberty
Horace Mann Teachers Training School, Pittsburg, Kans.

Henry C. Smith, Independence
Graceland College Group, Lamoni, Iowa
Kappa Sigma Fraternity House, Lawrence, Kans.
Alpha Chi Omega Sorority House, same

Study & Farrar, St. Louis
Mary Institute, St. Louis County
Teachers Training School, Southeast Missouri State Teachers College, Cape Girardeau
Sappington Grade School, Sappington

H. E. Wagenknecht, St. Joseph
High School, Clarence
High School, Welda, Kans.
Grade School, St. Joseph

MONTANA

Bird & van Teylingen, Great Falls
Great Falls High School, Great Falls
Conrad High School, Conrad
Roosevelt Grade School, Great Falls

J. G. Link, Billings (also Helena)
McKinley School, Butte
Fergus County High School, second unit, Lewistown
Hot Springs High School, Hot Springs, S. Dak.

McIver and Cohagen, Great Falls (also Billings)
Library, University of Montana, Missoula
Library, Normal School, Dillon
High School, Cody, Wyoming

Shanley, Willson & Hugenin, Great Falls (also Butte and Bozeman)
Anaconda Junior High School, Anaconda
Junior and Senior High School, Glasgow
Entomology Laboratory, Hamilton

NEBRASKA

Arthur D. Baker, Grand Island
Senior High School, Grand Island
Clay Center Combination School, Clay Center
Holbrook Combination High and Grade School, Holbrook

George A. Berlinghof, Lincoln
High School, Ashland
High School, Pierce
High School, Panama

N. R. Brigham, Omaha
Pershing Grade and Junior High School, East Omaha
Underwood Grade and Junior High School, Omaha
Monroe Grade School, Omaha

Frederick W. Clarke, Omaha
Sherman School, Omaha
Grade School, Central City
Omaha Technical High School, Omaha (with Edwin B. Clark)

Leo A. Daly, Omaha
New group of buildings, Nebraska School for the Deaf, Omaha
New group of buildings, St. Columban's Preparatory Seminary, near Silver Creek, N. Y.
Faculty Building remodeled and enlarged, Creighton University, Omaha

Davis & Wilson, Lincoln
Field House and Stadium, University of Nebraska, Lincoln
Kearney Junior High School, Kearney
Everett Junior High School, Lincoln

Everett S. Dodds, Omaha
Petersburg Grade and High School, Petersburg
Ralston Public School, Ralston
Elkhorn Grade and High School, Elkhorn

Marcus L. Evans, Hastings
Elementary School, Hastings
Elementary School, Culbertson
Elementary School, Indianola

E. L. Goldsmith & Co., Scottsbluff
Wheatland Grade School, Wheatland, Wyo.
Minatare High School, Minatare
Orleans High School, Orleans

George Grabe, Fremont
Genoa Public School, Genoa
Wakefield Public High School, Wakefield
Cedar Rapids Public School, Cedar Rapids

J. P. Helleberg, Kearney
State Training School, Kearney
Lexington High School, Lexington
Overton High and Grade School, Overton

Lahr & Stangel, Omaha
Father Flanagan's Boys' Home, Omaha
Notre Dame Academy, Omaha
St. Boniface Grade and High School, Westphalia, Iowa

Meginnis & Schaumberg, Lincoln
Student Activities Building, Lincoln
Irving Junior High School, Lincoln
Clinton Grade School, Lincoln

J. M. Nachtigall, Omaha
St. Joseph's Grade and Junior High School, Omaha
Duchesne College, Omaha
St. Benedict's Grade School, Omaha

Chas. W. Steinbaugh, Omaha
Washington Grade School, Omaha
High School, Manning, Iowa
Walnut Hill Grade School, Omaha

Jas. C. Stitt, Norfolk
Library, State Normal College, Chadron
Training School, State Normal College, Chadron
Auditorium-Gymnasium, Newman Grove School, Newman Grove

NEVADA

F. J. DeLongchamps, Reno
Educational Building, University of Nevada, Reno
Sparks Junior High School, Sparks
Elko Grammar School, Elko

George A. Ferris & Son, Reno
Las Vegas High School, Las Vegas
B. D. Billinghurst Junior High School, Reno
Fourth Street Junior High School, Reno

NEW HAMPSHIRE

E. T. Huddleston, Durham
University of New Hampshire, Durham:
Hetzel Hall (men's dormitory)
Murkland Hall (classroom building)
Charles James Hall (chemistry building)

Jens Fredrick Larson, Hanover
Baker Memorial Library, Dartmouth College, Hanover
Carpenter Fine Arts Building, Dartmouth College, Hanover
Amos Tuck School of Business Administration, Dartmouth College, Hanover

J. Edward Richardson, Dover
Dover High School Annex, Dover
Exeter High School, Exeter
Berwick High School, Berwick, Me.

Wells and Hudson, Hanover
South End Platoon School, Concord
Additions to Senior High School, Berlin
Dormitory, Colby School for Girls, New London

NEW JERSEY

Charles F. Ackerman, Newark
Blessed Sacrament School, Elizabeth
St. Elizabeth's School, Linden
Public School, Essex Fells

Ernst A. Arend, Asbury Park (also New York City)
Asbury Park High School, Asbury Park
Long Branch High School, Long Branch
Leonardo Grade School, Leonardo

Rolf William Bauhan, Princeton
Hun School Group, Princeton
Solebury School Group, New Hope, Pa.
Princeton Preparatory School Group, Princeton

H. B. Brady, Inc., Elizabeth
Thomas Jefferson Senior High School, Elizabeth
Grade School No. 8, Linden
Theodore Roosevelt School, Cranford

G. W. Brooks, Perth Amboy and Atlantic City
Sacred Heart School, New Brunswick
Our Lady of the Valley School, Orange
Holy Spirit High School, Atlantic City

Clinton B. Cook, Asbury Park
Addition to Toms River School, Toms River
Junior High and Vocational School, Lakewood
Grade School, Island Heights

J. Frederick Cook, Newark
School of Law, St. John's College, Brooklyn, N. Y.
First Avenue School, Newark
St. John's College High School, Brooklyn, N. Y.

Henry Barrett Crosby, Paterson
Grammar School No. 6, Paterson
Grammar School No. 13, Clifton
Grammar School No. 15, Clifton

Arthur E. Doré, Hackensack
High School addition, Westwood
Elementary and Junior High School No. 4, Hackensack
Elementary School, Westwood

Vincent J. Eck, Red Bank
Red Bank Catholic High School, Red Bank
St. Paul's Parochial School, Princeton
St. Joseph's Parochial School, North Plainfield

Edwards & Green, Inc., Camden
Bridgeton Junior and Senior High School, Bridgeton
Gloucester City High School (for Board of Education), Gloucester City
J. Heulings Coles School (for Board of Education), Delaware Township, Camden County

Fred A. Elsasser, Union
Union High School, Union
Abraham Clark High School, Roselle
Washington School, Union

Fanning & Shaw, Paterson
Eastside Senior High School, Paterson
Elementary School No. 8, Paterson
Monroe Street Elementary and Junior High School, Ridgewood

The P. L. Fowler Co., Trenton
Bordentown High School, Bordentown
Grammar School No. 1, Florence
Lawrenceville Public School, Lawrence Township, Mercer Co.

Greisen & Tuzik, Perth Amboy
Browntown School, Madison Township
Keasbey Public School addition, Keasbey
Middlesex County Vocational School No. 2, Perth Amboy

Guilbert & Betelle, Newark
Columbia High School, South Orange and Maplewood
High School, Great Neck, N. Y.
High School, New Rochelle, N. Y.

Hacker & Hacker, Fort Lee
Teaneck High School, Teaneck
John Hill School, Boonton
Merritt Memorial School, Cresskill

Hill & Gollner, Trenton
High School, Salem
Witherspoon Street School, Princeton
Hopewell Grade School, Bridgeton

John F. Kelly, Passaic
Thomas Jefferson School, Passaic
Memorial School, Passaic
Slovak Catholic School and Gymnasium, Passaic

Joseph Norman Hettel, Camden
Camden County Vocational School, Pensauken Township
Philadelphia College of Osteopathy, Philadelphia, Pa.
High School, Hammonton

Lucht & Anderson, Cliffside Park
Presbyterian Church School, Leonia
Trinity Evangelical Lutheran Church School, Hudson Heights
Swedish Evangelical Mission Church School, West New York

Wm. Mayer, Jr., West New York
Memorial High School, West New York
Public School No. 1, West New York
Public School No. 5, Cliffside Park

Arnold H. Moses, Camden
Audubon High School, Audubon
Pensauken Junior High and Grade School, Pensauken Township
Merchantville High School, Merchantville

John Noble Pierson & Son, Perth Amboy
New Market School, Piscataway Township
Somerville School, Somerville
Barnegat High School, Barnegat

C. Godfrey Poggi & William B. Bragdon, Elizabeth
Public School No. 8, Hillside
Junior High School, Dunellen
St. Michael's Parochial School, Cranford

F. Herbert Radey, Camden
Thomas Sharpe School, Collingswood
Mantua School, Mantua
Gibbstown School, Gibbstown

Ernest Sibley & Lawrence C. Licht, Palisade
High School, Princeton
High School, Orange
School for District No. 1 and Owen D. Young, Van Hornesville, N. Y.

Simpson & Rolston, Inc., Newark
Buckley School (private), Greenvale, N. Y.
Buckley School (private), Rumson
High School, Mechanicville, N. Y.

Wm. W. Slack & Son, Trenton
Lincoln Elementary and Intermediate School, Trenton
Junior High School, Oxford Furnace
Rider College, Trenton

Vivian B. Smith, Atlantic City
Wildwood High School, Wildwood
Ocean City High School, Ocean City
Margate School, Margate

John C. Van Vlandren, Paterson
Public School No. 20, Paterson
Memorial School, Totowa
Eastern Academy, Paterson

A. L. Vegliante, Garfield
Midland School No. 1, Midland Township
Monastery and School, Italian Capuchin Fathers, Bronx, N. Y.
Church and School, Our Lady of Mount Carmel R. C. Church, Passaic

Jacob J. Vreeland, Dover
Lincoln School, Rockaway
Denville School, Denville Township
Blairstown School, Blairstown Township

Wentworth & Vreeland, Paterson
School No. 13, Paterson
Wayne School, Wayne Township
Monroe High School, Monroe, N. Y.

NEW MEXICO

Gaastra & Gladding, Albuquerque (also Santa Fe)
Eugene Field Grade School, Albuquerque
University of New Mexico Group, Albuquerque: Biological Building, Gymnasium, Lecture Hall and Dormitory
Grants Union High School, Grants

John Gaw Meem, Santa Fe
Douglas Avenue Grammar School, Las Vegas
Los Alamos Ranch School, Santa Fe
Fountain Valley School, Colorado Springs, Colo.

George Williamson, Inc., Albuquerque
Manual Arts-Albuquerque High School, Albuquerque
New Mexico School of Mines, Socorro
Spanish-American Normal School, El Rito

NEW YORK

William Adams, New York City
North Bellmore Public School, North Bellmore
Bellmore School, Bellmore
Hessel Memorial Hall, Woodmere Academy, Woodmere

Carl C. Ade, Rochester
Waterloo High School, Waterloo
Watkins Glen High School, Watkins Glen
Bolivar High School, Bolivar

Associated Buffalo Architects, Inc., Buffalo
Lewis J. Bennett High School, Buffalo
Public School No. 31, Buffalo
Public School No. 71, Buffalo

E. G. Atkinson, Schenectady
Greenport School, Greenport,
Central School, District No. 1, Lebanon Springs
Van Antwerp School, Niskayuna

Bagg & Newkirk, Utica
East Utica High School, Utica
Chemistry Building, Hamilton College, Clinton
Roosevelt School addition, Utica

Dwight James Baum, Riverdale-on-Hudson
Hendricks Chapel and Citizenship Building, Syracuse University, Syracuse
Administration Building, Wells College, Aurora
Science Building, Hartwick College, Oneonta

Beck & Tinkham, Jamestown
Love Elementary School, Jamestown
Jefferson Junior High School (Guilbert & Betelle, Associates) Jamestown
Board of Education Administration Building, Jamestown

Edward J. Berg, Utica
Our Lady of Lourdes School, Utica
Academy Field House, Utica
Church of Annunciation School, Ilion

Francis J. Berlenbach & Sons, Brooklyn
Our Lady of the Miraculous Medal Parochial School, Borough of Queens, New York City
St. Theresa Parochial School, Woodside, Borough of Queens, New York City
St. Joseph's Parochial School, Brooklyn

Wesley Sherwood Bessell, New York City
Mount Vernon Seminary, Washington, D. C.
Public School, Port Washington
Public School, Freeport

Gerard W. Betz, Kingston
Grade and High School, Walden
Grade School, Glasco
High School and Manual Training Building, Kingston

Frank H. Bissell, New York City
St. Gabriel's School, New Rochelle
Roger Ludlow Junior High School, Norwalk, Conn.
Rye Neck High School, Mamaroneck

Bley & Lyman, Buffalo
Canisius College Group, Buffalo
Lackawanna High School, Lackawanna
Harding School, Kenmore

R. L. Bowen, Schenectady
Mt. Pleasant High School, Schenectady
Oneida Intermediate School, Schenectady
Euclid Elementary School, Schenectady

A. L. Brockway, Syracuse
Elmwood Grade and Grammar School (including auditorium and gymnasium), Syracuse
Le Moyne Grade and Grammar School (including auditorium and gymnasium)
Syracuse Central High School, Syracuse

Frank Burkhard, New York City
Nativity School, Poughkeepsie
St. Joseph's School, New York City
Villa Maria Academy, The Bronx, New York City

Charles A. Carpenter, Rochester
Phelps Union and Classical School, Phelps
Departmental Church School, Christ Episcopal Church, Poughkeepsie
Departmental Church School, First Methodist Episcopal Church, Lockport

Paul Cerrina, New Rochelle
Gymnasium Building, Salesian High School, New Rochelle
Salesian Seminary, Newton, N. J.
Salesian Boys School, Goshen

G. Howard Chamberlin, Yonkers
Roosevelt High School, Yonkers
Benjamin Franklin School, Yonkers
Longfellow School, Yonkers

Walter B. Chambers, New York City
Bingham and McClellan Halls (dormitories), Yale University, New Haven, Conn.
Lawrence Hall (lecture) and Stillman Hall (dormitory), Colgate University, Hamilton
McGregory Hall (Chemistry Laboratory), Colgate University, Hamilton

Carl W. Clark, Cortland
Williamson Central School, Williamson
Warners High School, Warners
Tully Central School, Tully

Coffin & Coffin, New York City
Saratoga Springs High School, Saratoga Springs
Group of buildings, El Instituto Ingles, Santiago, Chile
Two Elementary Schools, Greenwich, Conn.

George W. Conable & Leon H. Smith, New York City
Administration Building, Lecture Halls and Dormitory, Wagner College, Staten Island
Cortland High School, Cortland
North Side School, East Williston

Conrad & Cummings, Binghamton
Benjamin Franklin School, Binghamton
Alexander Hamilton School, Binghamton
West Corners School, Union

Cook & Blount, New York City (associated with Lockwood Greene & Co., Inc.)
Frank Evans High School, Spartanburg, S. C.
Field House and Gymnasium, Yale University, New Haven, Conn.
Girls' Dormitory and Dining Hall, Bucknell University, Lewisburg, Pa.

Corbett, Harrison & MacMurray, New York City
Far Rockaway High School, New York City (Associate Architects)
DeWitt Clinton High School, New York City (Associate Architects)
Theodore Roosevelt High School, New York City (Associate Architects)

Howard F. Daly, Amsterdam
Senior High School, Amsterdam
Clizbe Avenue Grade School, Amsterdam
Junior High School, Amsterdam

R. H. Dana, Jr., New York City
New building for the Dalton Schools, Inc., New York City
St. Margaret's School, Waterbury, Conn.
Group of five buildings, Gunnery School, Washington, Conn.

Delano & Aldrich, New York City
Recitation Building, Lawrenceville School, Lawrenceville, N. J.
Sterling Chemistry Laboratory, Yale University, New Haven, Conn.
Music School, Smith College, Northampton, Mass.

Andrew L. Delehanty, Albany
School No. 26, Albany
St. Theresa Parochial School, Albany
Arbor Hill Junior High School, Albany

DePace & Juster, New York City
Mt. Carmel School, Elmsford
Loretta School and Center, New York City
R. C. Orphanage and School, Gladstone, N. J.

Dietel & Wade, Buffalo
St. Thomas Aquinas School, Buffalo
Orphan Asylum School, Buffalo
Christ the King School, Buffalo

O. W. & H. B. Dryer, Rochester
Fairport High School, Fairport
Honeoye Falls New Grade and High School, Honeoye Falls
Durand Eastman Grade School unit, Irondequoit

Raymond A. Freeburg, Jamestown
High School, Celeron
High School, Hilton
Junior and Senior High School, Falconer

Frank Frey, Rochester
Immaculate Conception School, Rochester
St. Ambrose School, Rochester
Corpus Christi School, Rochester

Fuller & Robinson Co., Albany
Albany Law School, Albany
Franklin Academy, Malone
Walter A. Wood High School, Hoosick Falls

August Henry Galow, Huntington
Lincoln School, Huntington Station
Franklin Square School, Hempstead
Central School, South Huntington

Clarence H. Gardinier, Albany
High and Grade School, Kinderhook
High and Grade School, Staatsburg
Junior High School, Rensselaer

Arthur N. Gibb, Ithaca
Henry St. John School, Ithaca
Ludlowville High School, Ludlowville
Junior High School, Ithaca

Archibald F. Gilbert, New York City
Lowville Academy and Grade School, Lowville
Alexandria Bay Grade and High School, Alexandria Bay
Granville High School, Granville

Thomas L. Gleason, Albany
Schoharie High School, Schoharie
Public School No. 27, Albany
Addition, Public School No. 23, Albany

Wm. H. Gompert, New York City
New York Training School for Teachers, New York City
DeWitt Clinton High School, New York City
Theodore Roosevelt High School, New York City

Goodwillie & Moran, New York City (also Glen Ridge, N. J.)
Memorial Parish School, Orange
Linden Avenue School, Glen Ridge
Central Grade School, Glen Ridge

Gordon & Kaelber, Rochester
New group of twelve buildings, Mens College, University of Rochester, Rochester
Benjamin Franklin High School, Rochester
Meharry Medical College, Nashville, Tenn.

Robert R. Graham, Middletown
Liberty Street Grade School, Middletown (D. H. Canfield, Associate Architect)
Florida High and Grade School, Middletown
Central Valley Junior High and Grammar School, Central Valley

Edward B. Green & Sons—A. H. Hopkins, Buffalo
Crosby Hall; Central Heating Plant; Book Store Building, University of Buffalo, Buffalo
Nichols Country Day School for Boys, Buffalo
Kibler High School, Tonawanda

Edward Hahn, Hempstead
Mamaroneck High School, Mamaroneck
Floral Park-Bellrose Grade and Junior High School, Floral Park-Bellrose
Sunrise Park School, Wantagh

Earl Hallenbeck, Syracuse
Cazenovia Central School, Cazenovia
Jordan High School, Jordan
Camden High School, Camden

Haskell & Considine, Elmira
Horseheads Junior and Senior High School, Horseheads
School for District No. 6, Elmira
Public School No. 4, Elmira

I. Edgar Hill, Geneva
Coxe Hall, Hobart College, Geneva
High School, Andover
Dormitory Building, Hobart College, Geneva

John Mead Howells, New York City (originally Howells & Stokes)
Pratt Auditorium, Brooklyn
Science and Technology Building, Pratt Institute, Brooklyn
Chapel and dormitories, Wooster School, Danbury, Conn.

Paul Hueber, Syracuse
Blessed Sacrament School, Syracuse
St. Brigiol's School, Syracuse
St. Mary's School, Rome

Alvin W. Inman, Plattsburg
Plattsburg Junior High School, Plattsburg
Dannemora High School, Dannemora
Ausable Forks Central Rural School, Ausable Forks

Louis Jallade, New York City
Physical Education Building, University of Delaware, Newark, Del.
Physical Education Building, Skidmore College, Saratoga Springs
Grade School, Scarsdale

Oliver R. Johnson, Jamestown
Lakewood High School, Lakewood
Westfield High School addition, Westfield
Vocational School, No. 10, Dunkirk

William H. Jones, Yonkers
Parochial School for the Parish of St. Denis, Yonkers
Church and School of the Blessed Sacrament, The Bronx, New York City
Parochial School of Saint Margaret, The Bronx, New York City

L. J. Kaley, Binghamton
Hooper School addition, Endwell
Christopher Columbus School, Binghamton (Associate Architect)
Addition to Woodrow Wilson School, Binghamton

F. J. & W. A. Kidd, Buffalo
East High School, Buffalo
Riverside High School, Buffalo
Kenmore High School, Kenmore

Office of D. D. Kieff, Watertown
West Carthage High School, Carthage
Edwards High School, Edwards
Massena School, Massena

Beverly S. King, New York City
Administration Building, Lincoln College, Lincoln, Ill.
Science Hall, Lincoln College, Lincoln, Ill.
The Pingrey School, Elizabeth, N. J.

Melvin L. King, Syracuse
Forest Hill Drive School, Syracuse
John Van Duyn School, Syracuse
East Syracuse High School, East Syracuse

Kinne & Frank, Utica
Grade School, Oneonta
Lyons Falls High School, Lyons Falls
Canajoharie High School, Canajoharie

Frank W. Kirkland, Rome
Columbus Grade School, Rome
DeWitt Clinton Grammar and Grade School, Rome
Forestport Union Free School, District No. 10, Forestport

Kirkpatrick & Cannon, Niagara Falls
Trott Vocational School, Niagara Falls
Niagara University Group, Niagara Falls: Dormitory Group, Gymnasium
La Salle Junior High School, Niagara Falls

A. Lawrence Kocher, New York City
Grade School, Pennsylvania State College, State College, Pa.
Dairy Barn, same
Grade School, Berwick, Va.

A. T. Lacey & Son, Binghamton
East Junior High School, Binghamton
Addition to High School, Endicott
West Junior High School, Binghamton

William I. La Fon, Jr., Southampton
Southampton High School, Southampton
Eastport High School, Eastport
Bellport Grade School, Bellport

Lansing & Greene, Watertown
South Junior High School, Watertown
North Junior High School, Watertown
Potsdam High School, Potsdam

Simon Larke & Russell G. Larke, Niagara Falls
Hyde Park Grade School, Niagara Falls
Also schools in association with others, cooperating as Associated Architects of Niagara Falls

Lee & Hewitt, New York City (also Paterson, N. J.)
Clifton High School, Clifton, N. J.
School No. 15, Paterson, N. J.
Tenakill School, Closter, N. J.

Electus D. Litchfield, New York City
Macalester College Group, St. Paul, Minn.: General Group Plan for future development; Boys' Dormitory, Gymnasium, and Power House

George F. Lorenz, Rochester
St. Boniface School, Rochester
St. John the Baptist School, Lockport
Holy Trinity School, Webster

Oscar Lowinson, New York City
Marion Street School, Lynbrook
Atlantic Avenue School, Lynbrook
Uniondale School No. 2, Uniondale

Ludlow & Peabody, New York City
Two buildings, Wilson College, Chambersburg, Pa.
Science Building, Hampton Institute, Hampton
President's House, Stevens Institute, Hoboken, N. J.

Office of Henry J. McGill, New York City
Sports Building, College of New Rochelle, New Rochelle
Our Lady of Lourdes School, Queens Village
Good Shepherd School, Brooklyn

W. Philip McGovern, New York City
St. Francis' College, Brooklyn
St. Mark's School, Sheepshead Bay
Chaminade High School, Mineola

McKenna & Irving, New York City
St. Clement's Parochial School, South Ozone Park
Brooklyn Preparatory High School, Brooklyn
Our Lady of Victories Parochial School, Jersey City, N. J.

McKim, Mead & White, New York City
Harvard Graduate School of Business Administration, Cambridge, Mass.
Administration, Classroom and Recreation Buildings, Adelphi College, Garden City
Hall Laboratory of Chemistry, Olin Memorial Library, Shanklin Hall of Biology, Harriman Hall Dormitory, Wesleyan University, Middletown, Conn.

E. P. Mellon, New York City (also Pittsburgh, Pa.)
Group of buildings, Shady Side Academy, Pittsburgh, Pa.
Group of buildings, Pennsylvania College for Women, Pittsburgh, Pa.
Memorial Library, Choate School, Wallingford, Conn.

Henry Killam Murphy, New York City
Hopkins Grammar School, group of new buildings, New Haven, Conn.
Group of new buildings, Yenching University, Peiping, China
Ginling College group of new buildings, Nanking, China

Murphy and Lehmann, Brooklyn
St. Agnes' Seminary, Brooklyn
Resurrection School, Rye
Our Lady of Guadalupe School, Brooklyn

Leland Henry Niles, Amsterdam
Vrooman Avenue School, Amsterdam
Fifth Ward School, Amsterdam
District No. 2 School, Amsterdam

Charles F. Obenbach, Niagara Falls
Hyde Park Junior High School, Niagara Falls (associated)
Niagara Street Grade School, Niagara Falls (associated)
Administration Building, Board of Education, Niagara Falls

E. Dean Parmelee, New Rochelle
Central School addition, Mamaroneck
Mamaroneck Avenue School Annex, Mamaroneck
Murray Avenue School Annex, Larchmont

Peabody, Wilson & Brown, New York City
Westbury High School, Westbury
Grade School, Cold Spring Harbor
Grade School, Woodbury

Pember & Demers, Albany
Utica Country Day School, New Hartford
St. Agnes School, Albany
West Rutland High School, West Rutland, Vt.

Chester R. Phelps, Niagara Falls
North Junior High School, Niagara Falls
Niagara Street School, Niagara Falls
Lewiston Grade and High School, Lewiston

Pierce & Bickford, Elmira
South Side High School, Elmira
Elm Street School, Waverly
Parley Coburn School, Elmira

Charles A. Platt, New York City
Library, University of Illinois, Urbana, Ill.
Architectural Building, same
George Washington Hall, Phillips Academy, Andover, Mass.

Cyrus K. Porter & Sons, Buffalo
Foster Hall, University of Buffalo, Buffalo (McKim, Mead & White, Associate Architects)
Edmund Hayes Hall, University of Buffalo, Buffalo
17th Street School, Niagara Falls

Wilson Potter, New York City
High School, Peekskill
High School, Geneva
High School, Oneida

Randall & Vedder, Syracuse
Sayre High School, Sayre, Pa.
Washington Irving Grade School, Syracuse
Frazer Grade School, Syracuse

Rasmussen & Wayland, New York City
Bernardsville High School, Bernardsville, N. J.
Allendale Grade School, Allendale, N. J.
Wilson Borough Junior-Senior High School, Easton, Pa.

Victor Reeser, Inc., New York City
Group of buildings, St. Joseph's School for the Instruction of the Blind, Jersey City, N. J.:
School and Home for Adults
School and Dormitory for Boys
School and Dormitory for Girls

Robert J. Reiley, New York City
St. Joseph's Academy, Brentwood
Immaculate Conception Seminary, Huntington
Holy Trinity School, Mamaroneck

Marcus T. Reynolds; Kenneth G. Reynolds, Associate, Albany
School Four, Albany
William S. Hackett Junior High School, Albany
Albany Academy Group, Albany

Ralph M. Rice, New York City
West Street Grade School, Newburgh
Chestnut Street School, Newburgh
Addition to Beacon High School, Beacon

Palmer Rogers, New York City
Northside High School, Corning
High School and Grade School, Addison
High School and Grade School, Sidney

Rossiter & Muller, New York City
Foxmeadow Grade School, Scarsdale
Scarsdale High School, Scarsdale
Edgewood School, District No. 1, Scarsdale

William L. Rouse, New York City
School and Settlement House, Federation Settlement House, New York City
School and Settlement House, The Madison House, New York City
Addition to Hebrew Technical Institute, New York City

J. M. Ryder, Schenectady
Scotia High School, Scotia
St. Johnsville High School, St. Johnsville
Stillwater High School, Stillwater

Francis R. Scherer, Rochester
Lexington School No. 34, Rochester
Abelard Reynolds School No. 42, Rochester
Frank Fowler Dow School No. 52, Rochester

A. F. A. Schmitt, New York City
Immaculate Conception School, New York
St. Pius School, New York City
Capuchin College, Garrison

A. W. E. Schoenberg, Olean
Ellicottville High School, Ellicottville
Richburg High School, Richburg
Belmont High School, Belmont

Frederick J. Schwarz, New York City
St. Joseph's Roman Catholic School, Bayonne, N. J.
Holy Trinity School, Yonkers
Holy Rosary Roman Catholic School, Passaic, N. J.

Albert M. Skinner, Watertown
Cooper School, Watertown
Washington and Lincoln Schools, Ogdensburg
Sacket Harbor High School, Sacket Harbor

Edward C. Smith, Poughkeepsie
Christopher Columbus Grade School (Public School No. 3), Poughkeepsie
Warring Grade School (Public School No. 10), Poughkeepsie
Grade and High School, Arlington

Howard Leland Smith, New York City
West End School, Long Beach
East End School, Long Beach
Park Street School, Long Beach

Smith & Stickney, Rochester
Hamlin Grade School, District No. 6, Hamlin
Greece Grade School, District No. 5, Greece
Manchester High School, District No. 8, Manchester

Frank A. Spangenberg, Buffalo
Seneca Vocational School, Buffalo
Hamburg High School, Hamburg
Grade and High School, Clifton Springs

W. H. Spaulding, Jamaica
Grade School, Union Free School District No. 27, West Hempstead
Grade School, Union Free School District No. 16, Elmont
Grade School, Union Free School, District No. 9, Williston Park

Starrett & Van Vleck, New York City
White Plains High School, White Plains
Isaac E. Young Junior High School, New Rochelle
George Innes Junior High School, Montclair, N. J.

Philip Steigman, Brooklyn
Yeshiva D'Brooklyn (High School and College), Brooklyn
Yeshiva Torah Vo-Daath (High School and College), Brooklyn
Yeshiva Isaac Jacob Reiners (High School and College), Brooklyn

Gustave E. Steinback, New York City
St. Joseph's College for Women, Brooklyn
St. Benedict's School, New York City
Quigley Memorial Seminary, Chicago, Ill. (Joseph W. McCarthy, Associate Architect)

Stoughton & Stoughton, New York City (also Winnipeg, Canada)
Polytechnic Institute of Porto Rico, San German, P. R.:
Girls' Dormitory
Boys' Dormitory
Commons
Buildings for the University of Manitoba, Winnipeg

Herbert C. Swain, Buffalo
Eden High School, Eden
Silver Springs High School, Silver Springs
Newfane High School, Newfane

Thomas & Baker, New York City
Auditorium, Albany Teachers College, Albany
Buffalo Teachers College, Buffalo
Students' Classroom Building, Albany Teachers College, Albany

Thompson, Holmes & Converse, New York City
New group of buildings, Hunter College of the City of New York, New York City (associated with Charles B. Meyers, New York City)
School of Business, College of the City of New York, New York City
Dalton High School, Dalton, Mass.

Edward Lippincott Tilton, New York City
Welch Medical Library, Johns Hopkins University, Baltimore, Md.
Central High School, Johnstown, Pa.
Caflisch Memorial Hall, Allegheny College, Meadville, Pa.

Tooker & Marsh, New York City
High School, Oyster Bay
High School, Pleasantville
High School, Ticonderoga

Wm. B. Tubby, New York City
Roslyn High School, Roslyn
Roslyn Grade School, Roslyn
Bedford Junior High School, Westport, Conn.

Hobart B. Upjohn, New York City
Group of eight buildings, North Carolina State College, Raleigh, N. C.
Group of five buildings, St. Catherine's School for Girls, Richmond, Va.
Two dormitories, Salem College, Winston-Salem, N. C.

E. P. Valkenburgh, Middletown
Albert Street Grade School, Middletown
Warwick High School, Warwick
South Fallsburg High School, South Fallsburg

W. Brown Van Dreser, Gloversville
New Junior High School, Gloversville
Estee High School, Gloversville
Stratford Grade and High School, Stratford

John V. van Pelt, New York City
Gennadeion Library Group and Residence Hall, American School of Classical Studies in Athens (Van Pelt and Thompson)
Church School and Rectory of the Church of the Guardian Angels, Tuckahoe
School and Convent, Church of the Immaculate Conception, Tuckahoe

Robert P. Vignola, Harrison
Silver Lake Grade School, Harrison
Halstead Avenue School, Harrison
Purchase Grade School, Harrison

Theodore Visscher & James Burley, New York City
James Ward Packard Laboratory of Electrical and Mechanical Engineering, Lehigh University, Bethlehem
University Library, Lehigh University, Bethlehem
Science Building, Hampden-Sidney College, Hampden-Sidney, Va.

C. Edward Vosbury, Binghamton
Johnson City High School, Johnson City
Theodore Roosevelt School, Johnson City
Palm Harbor School, Clearwater, Fla.

D. Everett Waid, New York City
Gymnasium, Girls' Dormitory and Chapel, Monmouth College, Monmouth, Ill.
President's House, Men's Dormitory and Administration Building, College of Wooster, Wooster, Ohio

J. Foster Warner, Rochester
Aquinas Institute of Rochester, Rochester
Blessed Sacrament School, Rochester
Holy Family School, Auburn

Harold H. Werner, New York City
William Wilson Jr. School No. 6, Mt. Vernon
Mount Vernon High School addition, Mt. Vernon
De Witt Clinton School No. 9 addition, Mt. Vernon

John C. Westervelt, New York City
Laboratory and Greenhouses, Plant Industry Building, and Library Building (not yet built), New York State College of Agriculture, Cornell University, Ithaca

H. Herbert Wheeler, New York City
Chi Psi Lodge, New Haven, Conn.
Chi Psi Lodge, Middlebury, Vt.
Chi Psi Lodge, Middletown, Conn.

J. Russell White, Albany
Bolton Central School, Bolton Landing
Indian Lake Central School, Indian Lake
Grade and High School, Middleville

Frederic P. Wiedersum, Valley Stream
Valley Stream High School, Central High School District No. 1, Valley Stream
Malverne Grade School, Malverne
Union Free School, District No. 24, Valley Stream

Samuel De P. Williams, Ogdensburg
Six-room Grade School, Massena
Eight-room Grade School, Massena
Waddington High School, Waddington

York & Sawyer, New York City
Euthenics Building, Vassar College, Poughkeepsie
Legal Research Building, University of Michigan, Ann Arbor, Mich.
Gymnasium, Rutgers University, New Brunswick, N. J.

NORTH CAROLINA

Atwood and Nash, Inc., Chapel Hill
Library, University of North Carolina, Chapel Hill
Commerce Department Building, University of North Carolina, Chapel Hill
Library and Dormitory, Peace Institute, Raleigh

Harry Barton, Greensboro
Senior High School, High Point
Auditorium, North Carolina College for Women, Greensboro
Music Building, North Carolina College for Women, Greensboro

Benton & Benton, Wilson
Selma Public School, Selma
North Carolina School for the Deaf, Morgantown
Appalachian State Teachers College, Boone

G. R. Berryman, Raleigh
Seven buildings, East Carolina Teachers College, Greenville
Eastern Carolina Training School for Boys, Rocky Mount
High School and three Grammar Schools, Greenville

Percy Bloxam, Salisbury
Group of buildings, Catawba College, Salisbury
Seven schools, Rowan County
Two schools, Rutherfordton County

William Henley Deitrick, Raleigh
Raleigh High School, Raleigh
County School, Carpenter, Wake County
North Wake School, Wake County

Douglas D. Ellington, Asheville
Senior High School, Asheville
Auditorium, Park Avenue School, Asheville
Central Service Plant, Municipal College, Asheville

Eric G. Flannagan, Henderson
Robersonville High School, Robersonville
Woodland-Olney School, Woodland
Charles Aycock School, Vance County

Ronald Greene, Asheville
High School, Valley Springs
High School, Weaverville
Stevens Lee High School, Asheville

Charles C. Hartmann, Greensboro
Agricultural and Technical College, Greensboro
Lenoir Rhyne College, Hickory
Proximity School, Greensboro

Q. E. Herman, Hickory
Balls Creek Consolidated School, Catawba County
Sawmills Consolidated School, Caldwell County
Ellendale Consolidated School, Alexander County

Charles C. Hook and Walter W. Hook, Charlotte
First unit, Myers Park School, Charlotte
West Wing, Graham High School, Charlotte
Sarah Morrison Building, Queens College, Charlotte

James W. Hopper, Leaksville
Wentworth High School, Wentworth
Bethany Consolidated School, Bethany
Douglas High School, Leaksville

Herbert B. Hunter, High Point
New group of buildings, High Point College, High Point: Administration Building, Science Building, Boys' and Girls' Dormitories
New group of buildings, Elon College, Elon: Administration Building, Auditorium, Christian Education Building, Library Building, and Science Building
New group of eleven buildings (contract awarded for first two), Atlantic Christian College, Wilson

Lynch & Foard, Wilmington
Addition to Pineland School, Salemburg
Stephen's High School, Warsaw
Williston Industrial School, Wilmington

Harold Macklin, Winston-Salem
Colored High School, Winston-Salem
South Park Grammar School, Winston-Salem
Kimberly Park Grammar School, Winston-Salem

M. R. Marsh, Charlotte
Plaza Road School, Charlotte
Fairview Elementary School, Charlotte
Mt. Pleasant High School, Mt. Pleasant

Northrup & O'Brien, Winston-Salem
North Junior High School, Winston-Salem
South Junior High School, Winston-Salem
Columbia Heights Grade School, Winston-Salem

James A. Salter, Raleigh
Franklin Public School, Franklin
Administration Building, Methodist Orphanage, Raleigh
West Raleigh School, Raleigh

Harry J. Simonds, Greensboro
Colonial School, Thomasville
Washington Street (colored) School, Greensboro
Junior High School, Greensboro

Erle G. Stillwell, Hendersonville
Hendersonville High School, Hendersonville
Dana High School, Dana
Dormitory, Western Carolina Teachers College, Cullowhee

NORTH DAKOTA

Ernest R. Boyd, Jamestown
Washington Grade School, Jamestown
Teachers' Training School, Valley City
Teachers' Training School, Minot

Bugenhagen & Molander, Minot
Minot Junior High School, Minot
Velva State Agriculture High School, Velva
Rugby High School, Rugby

Jos. Bell DeRemer, Grand Forks
New Gymnasium and Classroom unit, Central High School, Grand Forks
Liberal Arts Building, University of North Dakota, Grand Forks
St. Mary's Parochial School, Grand Forks

Gilbert R. Horton, Jamestown
Men's Dormitory, Jamestown College, Jamestown
High School and Grade School, Litchfield, Minn. (J. McG. Miller, Rochester, Minn., Associate Architect)
Bordulac Grade and High School, Bordulac

William F. Kurke Co., Fargo
Central Grade School, Fargo
Agricultural Building, North Dakota Agricultural College, Fargo
Law School Building, University of North Dakota, Grand Forks

H. M. Leonard, Bismarck
Elgin High School, Elgin
High School Auditorium-Gymnasium, New Salem
High School addition, Beulah

Ira L. Rush, Minot and Bismarck
High School, Crosby
High School, Mott
Girls' Dormitory, Teachers College, Minot

Van Horn & Ritterbush, Bismarck
Roosevelt Grade School, Bismarck
Boys' Dormitory, State Training School, Mandan
Girls' Dormitory, State Training School, Mandan

OHIO

John S. Adkins, Architect; **Hubert M. Garriott,** Associate Architect, Cincinnati
Riley Junior High School, Logansport, Ind.
Onward Consolidated School, Onward, Ind.
Denver Memorial Hall, Wilmington College, Wilmington

A. M. Allen & Co., Cleveland
Charles F. Brush High School, South Euclid
Maple Heights High School, Maple Heights
Southington Township School, Southington

Althouse & Jones, Mansfield
Mansfield Senior High School, Mansfield
Junior High School, Galion
High School, Crestline

John Woodhouse Bagley, Cleveland
Columbia Township High School addition, Columbia Center
Eaton High School, North Eaton
East Carlisle Grade School, La Porte

Geo. W. Barkman, Hamilton
Three Grade Schools, Hamilton
Hanover Township Centralized School, Butler County
Fairfield Township Centralized School, Butler County

Paul Boucherle, Youngstown
Rutherford B. Hayes Junior High School, Youngstown
Poland Union School, Poland
Y. M. C. A. Educational Building, Youngstown

Jos. N. Bradford, University Architect, Columbus
Ohio State University, Columbus
Chemistry Building
Administration Building
Education Building

The Carter-Richards Co., Cleveland
High School addition, Bedford
Ellenwood Grade School, Bedford
Interstate Grade School (heating), Bedford

Charles Frederick Cellarius, Cincinnati
Bond Hill School, Cincinnati
Norwood Junior High School, Norwood
Fairfax School, Plainville Rural School District, Hamilton County

Crowe & Schulte, Cincinnati
Purcell High School, Cincinnati
St. Agnes School and Auditorium, Cincinnati
Holy Angels School, Cincinnati

F. H. De Aement & Co., Akron
Woodland Grade School, Canton
Springfield Grade and High School, Ellet
Northampton Township Grade School, Summit County

DeVoss & Donaldson, Portsmouth
U. S. Grant Junior High School, Portsmouth
Woodrow Wilson Elementary School, Portsmouth
Waverly High School, Waverly

Gustave W. Drach, Inc., Cincinnati
Victoria Hall (Nurses' Training School), Good Samaritan Hospital, Cincinnati
Heberle School, Cincinnati
Gymnasium and Auditorium Building, St. Bernard School, St. Bernard

Eastman & Budke, Springfield
Kenwood Heights Grade School, Springfield
Science Building, Antioch College, Yellow Springs (Herbert Baumer, Ohio State University, Consultant)
Hayward Junior High School, Springfield

Fechheimer & Ihorst, Cincinnati
Roosevelt Public School, Cincinnati
Group of buildings, Hebrew Union College, Cincinnati
Public School, Mariemont (model town)

Charles E. Firestone & Lowell Christman, Canton
John K. Baxter School, Canton
East Canton School, East Canton
Fairmount School, Canton

Fox, Duthie & Foose, Cleveland
Kensington School, Rocky River
Kirtland School, Kirtland
Allen School, Elyria

Charles W. Frank, Akron
Men's Club Building, Oberlin
Twelve Men's Buildings, Oberlin

H. O. Fullerton, Cleveland
Mexico Grade and High School, Mexico, N. Y.
West Leyden Central School, West Leyden, N. Y.
Constableville Grade and High School, Constableville, N. Y.

Fulton & Taylor, Cleveland
Berea High School, Berea
Parma Junior High School, Parma
Garfield Heights High School, Garfield Heights

Garber & Woodward, Cincinnati
Western Hills Junior-Senior High School, Cincinnati
Mt. Logan Public School, Chillicothe
Marietta High School, Marietta

Garfield, Stanley-Brown, Harris & Robinson, Cleveland
Institute of Pathology, Western Reserve University, Cleveland
Music Building, Lake Erie College, Painesville
Science Building and Dormitory, Kenyon College, Gambier

Edwin M. Gee, Toledo
J. A. DeVilbiss High School, Toledo
J. D. Robinson Junior High School, Toledo
Harvard School, Toledo

J. Kerr Giffen, Canton
Cambridge Hall, Muskingum College, New Concord
Dennison Junior-Senior High School, Dennison
Smithfield High School, Smithfield

F. F. Glass, Columbus
Ashville High School, Ashville
Carroll High School, Carroll
Norwich High School, Hilliards

John H. Graham & Co., Cleveland
Laurel School for Girls, Cleveland
Monticello Junior High School, Cleveland Heights
Oxford Grade School, Cleveland Heights

Harry Hake, Cincinnati
Library, Cincinnati University, Cincinnati
Law College, Cincinnati University, Cincinnati
Administration Building, Lincoln Memorial University, Harrogate, Tenn.

Lawrence H. Hall, Dayton
Centralized High and Grade School, Pleasant Hill
Centralized High and Grade School, Jeffersonville
High School, Olive Branch, Clark County

Samuel Hannaford & Sons, Cincinnati
Wyoming Grade and High School, Wyoming
High School, Lebanon
Oyler School, Cincinnati

Robert S. Harsh, Columbus
Miami University, Oxford:
Recitation Building
McGuffy Building
Fisher Hall and Oxford College Building (dormitories)

Geo. M. Hopkinson, Cleveland
John Hay High School, Cleveland
Nathan Hale Junior High School, Cleveland
Robert Fulton Elementary School, Cleveland

Hubbell & Benes Co., Cleveland
Shaker Heights School, Cleveland
Fenn Building, Y.M.C.A. School of Technology, Cleveland
Swimming Pool, Western Reserve Academy, Hudson

Peter M. Hulsken, Lima; **Lyman T. Strong,** Associate
High School, Celina
High School, Van Wert
High School, Spencerville

Jokel & Lange, Toledo
Mt. Vernon School, Adams Township, Lucas County
Clay School, Oregon Township, Lucas County
Coy School, Oregon Township, Lucas County

Keich, O'Brien & Hosker, Warren
Warren G. Harding High School, Warren
East Junior High School, Warren
West Junior High School, Warren

Clarence A. Kissinger, Youngstown
Grade School, Unity Township, Columbiana County
Grade and High School, Knox Township, Columbiana County
Grade and High School, Middleton Township, Columbiana County

H. F. Kling & Son, Youngstown
N. H. Chaney Junior High School, Youngstown
Boardman High School, Boardman
Mineral Ridge Grade School, Mineral Ridge

William Koehl, Cleveland
St. Augustine's Academy, Lakewood
St. Patrick's School, Cleveland
Brunnerdale Seminary, Stark County

M. M. Konarski, Akron
Ferdinand Schumacher School, Akron
David E. Hill School, Akron
Spicer School, Akron

Kraus & Helmkamp, Akron
St. Charles College, Columbus
St. Mary's High School, Lancaster
St. Sebastian's School, Akron

Kunz & Beck, Inc., Cincinnati
Mt. St. Mary Seminary, North Norwood
St. Joseph School, Covington, Ky.
St. Aloysius School, Elmwood Place

Langdon, Hohly & Gram, Toledo
Marsh Foundation Group, Van Wert; instructors' homes, cottages, Industrial Arts School, power plant, etc.
Addition to Swanton High School, Swanton
Addition to Washington Township High School, Trilby

M. P. Lauer, Akron
W. F. Rimer School, Kenmore
Loyal Oak School, Norton Township
Silver Lake School, Silver Lake

The J. E. Lewis Co., Canton
Shadyside High School, Shadyside
Jackson Township High School, Canton
Central High School, Uhrichsville

Office of Charles J. Marr, New Philadelphia
Bolivar High School, Bolivar
Richville School, Massillon
Sugarcreek-Shanesville School, Sugarcreek

W. M. McClure, Dayton
Fairview Grade School, Dayton
Westwood Grade School, Dayton
Washington Grade School, Dayton

Miller & Reeves, Columbus
Bexley Elementary and Junior High School, Columbus
Upper Arlington School, Upper Arlington, Columbus (Howard Dwight Smith, Associate Architect)
St. Paul's Parish House Church School, Columbus

Miller & Son, Youngstown
McDonald High School, McDonald
Brecksville High School, Brecksville
Cleveland Grade School, Youngstown

H. C. Millott, Sandusky
Central High School, Bellevue
Grade School and Gymnasium, Sycamore
Grade School, West Perkins Township

Mills, Rhines, Bellman & Nordhoff, Toledo
Toledo University Group, Toledo
Nazareth Hall (Boys' School), Grand Rapids
Ottowa Hills Elementary and Junior High School, Ottowa Hills

William Mills, Nelsonville
Gallipolis School, Gallipolis
Albany Consolidated School, Albany
Pomeroy School, Pomeroy

Frederick G. Mueller & Walter R. Hair, Hamilton
Junior High School, Hamilton
Catholic High School, Hamilton
Centralized School, Liberty Township, Butler County

Ralph Murray, Ironton
High School, Raceland, Ky.
High School, Chapmanville, W. Va.
High and Grade School, Waterloo

Nicklas & Rodrick, Cleveland
Shaw Technical High School, East Cleveland
Rocky River High School, Rocky River
Roosevelt Grammar School, South Euclid

Peterson & Clarke, Steubenville
Grant Junior High School, Steubenville
Toronto High School, Toronto
Cross Creek District High School, Follansbee, W. Va.

F. J. Porter, Columbus
Grade School, Wilmington
High School, Ontario
High School, Ludlow, Ky.

Potter-Gabele & Co., Cleveland
St. Mary's Parochial Grade and High School, Massillon
St. John the Baptist School and Auditorium, Akron
St. Benedict's Auditorium, Cleveland

Walter A. Rabold, Inc., Canton
Jefferson High School, R. R. No. 6, Dayton
Tuscarawas Grade and High School, Tuscarawas
Midvale High School, Midvale

Vernon Redding & Associates, Mansfield
Lincoln Junior High School, Canton
High School, Shelby
High School, Ashland

George B. Rheinfrank, Toledo
Maumee High School, Maumee
Chemical Laboratory, Defiance College, Defiance
Rossford Grade School, Rossford

Richards, McCarty & Bulford, Columbus
Ada Junior-Senior High School, Ada
High School, Canal Winchester
Four Marion Township schools, Franklin County

T. Ralph Ridley, Akron
Wooster Senior and Junior High School, Wooster
Medina High School, Medina
Perkins Normal School, Akron

Ronan & Ingleson, Inc., Columbus
Teachers' Training Building, Kent State College, Kent
Ascension Hall, Kenyon College, Gambier
High School and Auditorium, Oxford

Morris W. Scheibel & Wilbert H. Shaffer, Youngstown
Stambaugh School, Youngstown
Scienceville High School, Youngstown
Coitsville Township Schools, Youngstown

Schenck & Williams, Dayton
Roosevelt High School, Dayton
Oakwood High School, Oakwood Village, Dayton
Oakwood Grade School, Oakwood Village, Dayton

Charles S. Schneider & Francis Hirschfeld, Cleveland
Ludlow School, Shaker Heights, Cleveland
Fernway School, Shaker Heights, Cleveland
Lomond School, Shaker Heights, Cleveland

Granville E. Scott, Norwalk
High School, Willard
Grade and High School, Genoa
Washington High School, Utica

J. F. Sheblessy, Cincinnati
St. Bonaventura School, Cincinnati
St. Rita School for Deaf, Lockland
Roger Bacon High School, St. Bernard

S. H. Shively & Son, Fremont
Three Elementary Schools, one Junior High School, Fremont
Centralized School, Washington Township
Centralized School, Bettsville

Howard Dwight Smith, Columbus
One Senior High School, three Junior High Schools, and three Elementary Schools (for Board of Education), Columbus
Gymnasium and Field House, Wittenberg College, Springfield (Miller & Reeves, Associate Architects)
Orton Memorial Laboratory, Columbus (Miller & Reeves, Associate Architects)

Smull & Unger, Ada
John H. Taft Gymnasium, Ohio Northern University, Ada
College of Law Building, same
Holmes-Liberty High School, Bucyrus

S. P. Stewart & Son, Bowling Green
Practical Arts Building, Bowling Green State College, Bowling Green
Senior High School, Bowling Green
Malinta-Grelton Grade and High School, Malinta

Tietig & Lee, Cincinnati
Sayler Park School, Cincinnati
Addition to Kilgour School, Cincinnati
Addition to Hughes High School, Cincinnati

William Unger, Bucyrus
New Washington Rural School, New Washington
Jefferson Rural School, Leesville
John H. Taft Gymnasium, Ohio Northern University, Ada

Walker & Norwick, Dayton
Lincoln Junior High School, Dayton
Elementary and High School, North Baltimore
High School, Gibsonburg

Warner & Mitchell, Cleveland
Group of buildings, University of Kentucky, Lexington, Ky.
Group of buildings (for Board of Education), Ashland, Ky.
Group of buildings (for Board of Education), Cleveland

Richard A. Zenk & Roy T. Campbell, Youngstown
Hubbard Grade School, Hubbard
Gustavus High and Grade School, Gustavus
Conneaut Grade School, Conneaut

OKLAHOMA

Leonard H. Bailey, Oklahoma City
Prague High School, Prague
Hawthorne School, Oklahoma City
Shydler School, Oklahoma City

G. J. Cannon, Ponca City
St. Mary's Parochial School, Ponca City
McKinley Grade School, Ponca City
Roosevelt Grade School, Ponca City

A. C. Davis & Sons, Shawnee
Woodrow Wilson School, Shawnee
Horace Mann School, Shawnee
Grade School, Wewoka

Jos. I. Davis, Oklahoma City
High School, Idabel
Girls' Dormitory and Administration Building, Eastern Oklahoma College, Wilburton
Girls' Dormitory, Oklahoma Baptist University, Shawnee

Arthur Gorman, Bartlesville
Douglass School, Bartlesville
McKinley School, Bartlesville (Felt, Dunham & Kriehn, Kansas City, Mo., Associates)
Garfield School, Bartlesville (Felt, Dunham & Kriehn, Associates)

L. L. Howenstine, Muskogee
High School Gymnasium, Muskogee
Gymnasium addition to West High School, Muskogee
Pershing Ward School, Muskogee

A. J. Love & Co., Tulsa
High School, Wagoner
Barracks Building, Oklahoma Military Academy, Claremore
Public School, Broken Arrow

Donald McCormick, Tulsa
Group of buildings, Cascia Hall, School of the Augustinian Fathers, Tulsa
School and Rectory, St. Francis Xavier Parish, Tulsa
Junior League Home and School for Convalescent Crippled Children, Tulsa

Richard E. Richter, Okmulgee
Checotah Grade School, Okmulgee
Horace Mann Grade School, Okmulgee
Addition to High School, Okmulgee

Albert S. Ross, Ada
Senior High School, Ada
Health Education Building, East Central State Teachers College, Ada
High School, Maud

Leon B. Senter, Tulsa
High School, Ponca City
High School, Okmulgee
Grade Schools, Ponca City (not yet built)

R. W. Shaw, Enid
Central Elementary School, Guthrie
Public School, Waynoka
Gymnasium, Auditorium and Administration Building, Enid School System, Enid

Leland J. Shumway, Tulsa
Red Fork School, Tulsa
Carbondale School, Tulsa
Dawson School, Tulsa

H. O. Valeur & Co., Muskogee
Junior High School, Muskogee
Grade School, Stone Bluff
Negro High School, Muskogee

J. B. White, Ardmore
Junior High School, McAlester
Junior High School, Durant
Junior High School, Wynnewood

OREGON

Bennes & Herzog, Portland
Men's Dormitory Group, Oregon State College, Corvallis
Women's Building, Oregon State College, Corvallis
State Normal School, La Grande

C. N. Freeman, Portland
Beaverton High School and Gymnasium, Beaverton, Washington County
Oakridge High School, Oakridge, Lane County
Union High School, District No. 1, Benton County

Joseph Jacobberger & Alf. H. Smith, Portland
Gymnasium Building, Columbia University, Portland
St. Vincent's School of Nursing, Portland
Marylhurst College, Oswego

George H. Jones, Portland
High School of Commerce, Portland
John L. Vestal School, Portland
Duniway School, Portland

Knighton & Howell, Portland
Group of buildings, U. S. Grant High School, Portland
Junior High School, Salem
Senior High School, Medford (associated with Frank C. Clark, Medford)

Lawrence, Holford, Allyn & Bean, Portland
Campus layout, University of Oregon, Eugene: Museum of Fine Arts, Basketball Pavilion, Men's Dormitory
Clinic Building, University of Oregon Medical School, Portland

F. Marion Stokes, Portland
Milwaukie Union High School, Milwaukie
Hillsboro High School, Hillsboro
Battle Ground Union High School, Battle Ground, Wash.

Tourtellotte & Hummel, Portland
High School, Boise, Idaho
High School, Medford
Normal Grade and Training School, Ashland

F. Manson White, Portland
Albany College Building, Albany
Two Junior High Schools, Eugene
Chapman School, Portland

PENNSYLVANIA

J. E. Adams, Johnstown
Garfield Junior High School, Johnstown
Central Senior High School, Johnstown
Franklin Borough High School, Connemaugh

Harry W. Altman, Uniontown
Ben Franklin Junior High School, Uniontown
Masontown High School, Masontown
South Union Township High School, Uniontown

The Ballinger Co., Philadelphia and New York
Public Grade School, Woodbury, N. J.
Addition to Junior High and Grade School, Marcus Hook
Alpha Sigma Phi Fraternity House, State College

P. A. Bartholomew, Pittsburgh
Derry Township High School, West Derry
Salina High School, Salina
Southwest Greensburg Junior High School, Greensburg

Francis A. Berner, Pittsburgh
Grade School, Reserve Township, Allegheny County
Phi Gamma Fraternity House, Washington
Chapel and Dormitory, Toner Institute, Pittsburgh

Boyd, Abel & Gugert, Philadelphia
Junior High School, Haverford Township
Rosemont Grammar School and Auditorium, Radnor Township
Manoa Public School, Haverford Township

Clarence W. Brazer, Chester (also New York City)
Senior High School, Collingdale
Wetherill Elementary School, Chester
Ardmore Avenue Elementary School, Lansdowne

J. C. Brenton, Charleroi
Junior High School, Charleroi
Consolidated School, Fallowfield Township, Washington Co.
Centerville Grade School, Centerville

George W. Brugger, Canonsburg
Hawthorne School, Canonsburg
First Ward Grade School, Canonsburg
Trinity High School, Washington

Carlisle & Sharrer, Pittsburgh
Aliquippa Senior High School, Aliquippa
Alexander M. Scott Senior High School, North Braddock
Beaver Falls Senior High School, Beaver Falls

Horace W. Castor, Philadelphia
Pennhurst State School, Pennhurst
Upper Darby Township High School, Upper Darby
Four Elementary Schools, Upper Darby

Irwin T. Catharine, Philadelphia
Overbrook High School, Philadelphia
Group of two buildings: Simon Gratz Senior High School and Gillespie Junior High School, Philadelphia
Olney High School, Philadelphia

Cody & Kirby, Erie
West Millcreek High School, Erie County
Lawrence Park Grade and High School, Erie County
Lakewood Grade School, Erie County

Conrad C. Compton, Donora
Donora High School, Donora
Consolidated Grade School, Somerset Township, Washington County
Consolidated Grade School, Jefferson Township, Fayette County

Arthur P. Coon, Scranton
James Madison Grade School, Scranton
Philip Morse Grade School, Scranton
Moscow High School, Moscow

Paul P. Cret, Philadelphia
John Herron Art Institute School, Indianapolis, Ind.
Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia
Barnes Foundation, Merion

W. Holmes Crosby & Co., Oil City
Colestock High School, Titusville
Elizabeth Crawford School, Emlenton
14th St. School, Franklin

Henry D. Dagit & Sons, Philadelphia
St. Madeleine Sophie's School, Philadelphia
St. Richard's School, Philadelphia
Sacred Heart School, Riverton, N. J.

Davis & Dunlap, Philadelphia
Woodrow Wilson Junior High School, Camden, N. J.
Charles Sumner School, Camden, N. J.
Thomas Williams School, Wyncote, Montgomery County

Lester Merritt Davis, Scranton
St. Cyril and Methodius School, Olyphant
Washington School, Throop
New Milford Consolidated High School, New Milford

Office of J. A. Dempwolf, York
Shippensburg High School, Shippensburg
Bachman Memorial Parochial School, New Cumberland
St. John's Parochial School, York

Press C. Dowler, Pittsburgh
Sewickley High School, Sewickley
Dormont High School, Pittsburgh
Etna High School, Etna

W. G. Eckles Co., New Castle
Chapel, Science Building and Dormitory, Grove City College, Grove City
McCartney Library, Geneva College, Beaver Falls
Sewickley Academy, Sewickley

Folsom & Stanton, Philadelphia
St. Louis School, Yeadon
Philip Baker School, Wildwood Crest, N. J.
Primary and Junior High School, Clifton Heights

Fred A. Fuller, Erie
Fairview High School, Fairview
Group of buildings, St. John Kanty College, Erie: Dining Hall, Dormitories and Chapel
Group of buildings, Gannon Hall Boarding School, Erie: Chapel, Dormitories and Classrooms

D. H. Grootenboer, Pottsville
Gass Hill Grade School, Gass Hill
Brownsville Grade School, Brownsville
Tamaqua High School, Tamaqua

John B. Hamme, York
William Penn Senior High School, York
Memorial Library, Gettysburg College, Gettysburg
Dormitory Building, Hood College, Frederick, Md.

Lewis Hancock, Scranton
Consolidated High School, Damascus
Addition to High School, Taylor
Grade School and Gymnasium, Old Forge

Hasness & Albright, Harrisburg
High School and W. H. Ramsey Grade School, Stroudsburg
W. W. Rupert Memorial Grade School, Pottstown
High School, Spring City

Heacock & Hokanson, Philadelphia
Upper Darby Junior High School, Upper Darby Township
Abington Junior and Grade School, Abington Township
Jenkintown High School, Jenkintown

Thomas K. Hendryx, Bradford
Hobson Place Grade School, Bradford
Two Consolidated Grade Schools, McKean County
Fourth Ward Grade School, Bradford

Hersh & Shollar, Altoona
Altoona Senior High School Annex, Altoona
Keith Junior High School, Altoona
Junior High School, Lewistown

Hoffman-Henon Co., Philadelphia
La Salle College Group, Philadelphia
Rosemont College Group, Rosemont
Holy Ghost College, Cornwells

Norman Hulme, Philadelphia
Philadelphia College of Pharmacy and Science, Philadelphia
Women's Homeopathic Hospital and Nurses' Training School, Philadelphia
Church School, Western Presbyterian Church, Washington

Hunter & Caldwell, Altoona
Fairview Grade School, Altoona
Gaysport School, Hollidaysburg
Consolidated School, Alexandria

Ingham & Boyd, Pittsburgh
Training School for Teachers, Board of Education, Pittsburgh
Administration Building, same
Group of buildings, Shady Side Academy, Pittsburgh: Dining Hall, Dormitory and Gymnasium

Jacoby & Everett, Allentown
Dormitory, power plant and mess hall and President's residence, Cedar Crest College, Allentown
High School, Grade School, Nurses' College and Hospital, Sacred Heart Diocese, Allentown
Francis D. Raub Junior High School, Allentown

Janssen & Cocken, Pittsburgh
Hygeia Hall, College of Wooster, Wooster, Ohio
School, Annunciation Parish, Pittsburgh
Alumni Hall, University of Pittsburgh, Pittsburgh

Emil R. Johnson & Clarence F. Wilson, Uniontown
Physical Education Building, State Teachers College, California
Addition to Uniontown Senior High School, Uniontown
Charles E. Boyle Elementary School, Uniontown

Karcher & Smith, Philadelphia
Women's Fraternity Lodges and Bond Memorial Building, Swarthmore College, Swarthmore
Clothier Auditorium, Swarthmore College, Swarthmore
Chi Phi Fraternity House, Franklin and Marshall College, Lancaster

Lawrie & Green, Harrisburg
Senior High School, Hazleton
High School, New Cumberland
State Teachers College, Gymnasium Building, Indiana

Edward B. Lee, Pittsburgh
Peabody High School, Pittsburgh
Morgantown High School, Morgantown, W. Va.
Clifford B. Connelley Trade School, Pittsburgh

W. H. Lee, Philadelphia
Temple University College Building, Philadelphia
Temple University Medical School, Philadelphia
Temple University Union, Philadelphia

C. Howard Lloyd, Harrisburg
William Penn High School Group, Harrisburg
Auditorium and Gymnasium, High School, Steelton

Albert George Lowe, Pittsburgh
Highland Public School, West View
Junior High School, West View
Ridgewood Public School, West View

Mack & Sahm, Wilkes-Barre
Kingston High School, Kingston
West Pittston Junior and Senior High School, West Pittston (Collaborating Architect, Thomas H. Foster)
Pringle Grade School, Kingston

MacKenzie & Wiley, Philadelphia
Media Public School, Media
Eddystone Grammar School, Eddystone
Central School, Springfield, Delaware County

Magaziner, Eberhard & Harris, Philadelphia
Arter Hall, Allegheny College, Meadville
Murphy College Group, Sevierville, Tenn.: Administration Building, Recitation Hall, Boys' and Girls' Dormitories and Chapel
East Maine Conference Seminary, Bucksport, Me.

Office of A. Oscar Martin, Doylestown
Bensalem Township High School, Cornwells Heights
Bensalem Township Public Schools, Andalusia and Trevose
Middletown Township High School, Langhorne

J. M. McCollum, Pittsburgh
Centennial School, McKeesport
High School, Washington
Wilkins School, Swissvale

Mellor & Meigs, Philadelphia
Auditorium and Music Wing, Bryn Mawr College, Bryn Mawr
Science Hall, Haverford College, Haverford
Gymnasium, Pennsylvania Institute for the Deaf, Mount Airy, Philadelphia

Meyers & Johnson, Architects and Engineers, Erie
Art and Science Building, State Teachers College, Edinboro
Jefferson Grade School, Erie
Strong Vincent High School, Erie

C. R. Moffitt, McKeesport
Walnut Street School, Archer Street School and Market Street School, McKeesport
Hebrew Institute, McKeesport
Sacred Heart School, McKeesport

Paul Monaghan, Philadelphia
Science and Engineering Building, Villa Nova College, Villa Nova
Mt. St. Joseph's College for Women, Chestnut Hill
Library and Dormitory, Immaculata College, Frazier

Morris & Erskine, Philadelphia
Friends High School, Moorestown, N. J.
Moses Brown School, Providence, R. I.
Dormitory, Auditorium and Gymnasium, Cheyney Training School for Teachers, Cheyney

Muhlenberg Bros., Reading
Thirteenth and Union Streets Grade School, Reading
Union Township Consolidated Grade School, Ringtown
Albright College Group of new buildings, Reading

Frederick A. Muhlenberg, Reading
Four Grade Schools, Reading
Grade School, Lower Alsace Township
High School, Hamburg

Charles R. Peddle, Philadelphia (also Woodbury, N. J.)
Thomas A. Edison School, Westmont, N. J.
Stoy School, Westmont, N. J.
Bettlewood School, Westmont, N. J.

Emile G. Perrot, Philadelphia (also New York City)
Library, Fordham University, Fordham, N. Y.
Dormitory, Georgetown University, Washington, D. C.
Academy of the Sisters of the Order of St. Dominic, Newburgh, N. Y.

John H. Phillips, Pittsburgh
Miles Bryan High School, McKees Rocks
Margaret Bell Miller School, Waynesburg
Neville Township Junior High School, Neville Island

Watson K. Phillips, Philadelphia
York Avenue Grade School, Lansdale
Forest Avenue Grade School, Ambler
Whitpain Township High and Grade School, Blue Bell

Price & Walton, Philadelphia
Philips Memorial Building, State Teachers College, West Chester
Friends School, Atlantic City, N. J.
Dormitory for Girls, Oak Grove Seminary, Vassalboro, Me.

Thomas Pringle & Oliver J. Robling, Pittsburgh
Linden School, Pittsburgh
Madison School, Pittsburgh
Lincoln School, Pittsburgh

Henry L. Reinhold, Jr., Philadelphia
Academy of the New Church, Bryn Athyn
High School, Windber
Fraternity Houses, State College

Ritcher & Eiler, Reading
Senior High School, Reading
State Teachers College Training School, Lock Haven
Cochran Grade School, Williamsport

Ritter & Shay, Philadelphia
Liberty High School, Bethlehem
David Rittenhouse Junior High School, Norristown
Memorial Junior High School, Phoenixville

Ruhe & Lange, Allentown
Library, Muhlenberg College, Allentown
Consolidated School No. 1, Troxell's Crossing, South Whitehall Township
Annex and Gymnasium Buildings, Allentown High School, Allentown

Savery & Scheetz, Philadelphia
Junior High School, Lower Merion Township, Ardmore
Ashland Elementary School, Lower Merion Township, Ardmore
Junior High School Vocational Building, Lower Merion Township, Ardmore

Scholl & Richardson, Reading
Southern Junior High School, Reading
Oley Township School, Oley
N. C. Schaeffer School, Laureldale

Schwab, Palmgreen & Merrick, Pittsburgh
Arsenal High School, Pittsburgh
Versailles Borough School, Versailles
Sumac Street School, McKeesport

Henry Y. Shaub, Lancaster
George Ross Grade School, Lancaster
Manheim High School
West Lampeter Vocational High School, Lampeter

W. D. Shollenberger, Williamsport
Vocational High School, Williamsport
Montgomery-Clinton School, Montgomery
DeLong Memorial School, Washingtonville

Simon & Simon, Philadelphia
Swedesboro High School, Swedesboro, N. J.
Haddonfield High School, Haddonfield, N. J.
Engineering School, Drexel Institute, Philadelphia

H. Rex Stackhouse & W. W. Donohoe, Philadelphia
North Wildwood High School, North Wildwood, N. J.
A. V. Wood Gymnasium, Brunswick, Ga.
Middle Township High School, Cape May Court House, N. J.

James T. Steen & Sons, Pittsburgh
David B. Oliver Junior-Senior High School, Pittsburgh
Herron Hill Junior High School, Pittsburgh
O'Hara Township Grade School, Allegheny County

Louis Stevens, Pittsburgh
Grade School, Overbrook, Allegheny County
Dormitory, Polk State School, Polk
Hospital Building, Polk State School, Polk

Stewardson & Page, Philadelphia
Laboratory of Anatomy and Physiological Chemistry, University of Pennsylvania, Philadelphia
Dormitories, same
Dormitory, Haverford College, Haverford

G. W. Stickle, Erie
New group of buildings, Gannon Hall Boarding School, Erie
New building, St. John Kanty College, Erie
New group of buildings, St. Mary's College, North East

Carlton Strong, Pittsburgh
Physical Education Building, Seton Hill College, Greensburgh
Mt. Mercy School, Pittsburgh
St. George Parish School, Pittsburgh

The Thayer Co., New Castle
George Washington Junior High School, New Castle
Scotland Lane School, Lawrence County
Phillips Hall (girls' dormitory), Bethany, W. Va.

Robert Maurice Trimble, Pittsburgh
Taylor Alderdice High School, Pittsburgh
Taylor Alderdice High School Extension, Pittsburgh
Perry Hill School, Pittsburgh

Horace Trumbauer, Philadelphia
Two new groups, Duke University, Durham, N. C.
Irvine Auditorium, University of Pennsylvania, Philadelphia
Ogontz School for Girls, Rydal

Van's Engineering Service (Henry M. Rogers, Architect), Blairsville
Ebensburg High School, Ebensburg
Blairsville High School, Blairsville
Washington Township Grade School, Apollo

Albert J. Ward, Scranton
Technical High School, Scranton
Grade School No. 42, Scranton
Lincoln School, Blakely

Frank R. Watson, Edkins & Thompson, Philadelphia
Group of buildings, Ursinus College, Collegeville: Dormitory Group, Gymnasium and Dining Hall
Consolidated School, Dover, Del.
Oaklyn Public School, Oaklyn, N. J.

E. H. Wenzelberger, Easton
March Junior High School, Easton
Auditorium, Lower Mt. Bethel, Independent School District, Martin's Creek
Butztown School, Bethlehem Township School District

Ralph E. White, Philadelphia
Pennwynne Grade School, Pennwynne
Wynnewood Road Grade School, Wynnewood
Bryn Mawr Grade School, Bryn Mawr

Adam G. Wickersham, Homestead
St. Mary Magdalen's School, Homestead
Grade School, Munhall
Junior High School, Homestead

W. Ward Williams, Pittsburgh
Junior High School, Ambridge
High School, Freedom
Anthony Wayne Grade School, Ambridge

Witman & Royer, York
West York High School, West York
Smallwood Grade School, York
Theodore Roosevelt Grade School, York

Eric Fisher Wood & Co., Pittsburgh
Pennsylvania Training School, Morganza
State Teachers College, Mansfield
St. Irenaeus School, Pittsburgh

RHODE ISLAND

Walter F. Fontaine, Woonsocket
Woonsocket Junior High School, Woonsocket
College of Mount St. Charles, Woonsocket
Blackstone High School, Blackstone, Mass.

Joseph A. Hickey, Providence
Sons of Zion (special), Providence
Fairchild (elementary), Miami, Fla.
Velodrome (gymnasium), Hartford, Conn.

Howe & Church, Providence
Dormitory, St. George's School, Middletown
Junior High School, Bristol
Gymnasium, Brown University, Providence

Monahan & Meikle, Pawtucket
Senior High School, Pawtucket
Goff Junior High School, Pawtucket
Westerly Junior High School, Westerly

John F. O'Malley, Pawtucket
Holy Name Parish School, Providence
Central Falls High School, Central Falls
Assumption Parish School, Providence

Thomas J. Hill Peirce, Providence
Chalkstone Avenue Junior High School, Providence
Hartford Avenue Junior High School, Providence
Bucklin Street Junior High School, Providence

William R. Walker & Son, Providence
Senior High School, Cranston
Rhode Island College of Education, Providence
Junior High School, East Providence

SOUTH CAROLINA

F. H. & J. G. Cunningham, Greenville
Grey Court-Owings School Group, Grey Court
Stone School, Greenville
Woodruff High School, Woodruff

Charles William Fant, Anderson
Boys High School, Anderson
Grammar School, Seneca
Dormitory, Presbyterian College, Clinton

H. D. Harrall, Bennettsville
Gymnasium, Elementary School, Bennettsville
High School, Latta
Elementary School, Dillon

David B. Hyer, Charleston
Murray Vocational School, Charleston
North Charleston Graded School, North Charleston
Georgetown High School, Georgetown

Rudolph E. Lee, Clemson College
Girls' Dormitory, Lander College, Greenwood
Engineering Building, Clemson Agricultural and Mechanical College, Clemson College
Field House, Clemson Agricultural and Mechanical College, Clemson College

J. D. Newcomer, Charleston
St. Paul's High School, St. Paul Parish, Charleston County
Ridgeland High School, Ridgeland
Rosemont School, Rosemont

C. Gadsden Sayre, Anderson
Boyden High School, Salisbury, N. C.
Hugh Morson High School, Raleigh, N. C.
Hall Fletcher High School, Asheville, N. C.

J. E. Sirrine & Co., Greenville
Dormitory, Furman University, Greenville
Dining Hall, same
Athletic Building, same

James B. Urquhart, Columbia
Senior High School and addition, Columbia
Hand Junior High School, Columbia
Ellis Avenue School, Orangeburg

Charles C. Wilson, Columbia
Greenwood High School, Greenwood (J. C. Hemphill, Associate Architect)
Pine Street Grammar School, Spartanburg (W. Paul Williams, Associate)
High School, Lexington

W. Paul Williams, Spartanburg
High School, Inman
Colored Grammar School, Spartanburg
Pine Street School, Spartanburg (Associate Architect with Chas. C. Wilson, Columbia)

SOUTH DAKOTA

Walter J. Dixon, Mitchell
Auditorium, Yankton High School, Yankton
Tyndall Grade School, Tyndall
New Underwood Grade and High School, New Underwood

James C. Ewing, Rapid City
Gymnasium-Auditorium, State School of Mines, Rapid City
Jefferson Grade School, Rapid City
Roosevelt Grade School, Rapid City

Geo. F. Fossum, Aberdeen
Elementary School, Milbank
Simmons Elementary School, Aberdeen
High School, Havana

Hugill & Blatherwick, Sioux Falls
Gymnasium and Armory Building, University of South Dakota, Vermilion
High School, Belle Fourche
High School, Pierre

F. C. W. Kuehn, Huron
Science Hall, Brookings College, Brookings
Jefferson Grade School, Huron
Wilson Grade School, Huron

Perkins & McWayne, Sioux Falls
Library, State College of Agriculture and Mechanic Arts, Brookings
Student Union Building, University of South Dakota, Vermilion
Washington High School, Sioux Falls

TENNESSEE

George Awsumb, Memphis
South Side High School, Memphis
L. C. Humes High School, Memphis
Hernando Consolidated Grade and High School, Hernando, Miss.

Barber & McMurray, Knoxville
University of Tennessee, Knoxville:
Physics and Geology Building
Chemistry Building
Library Building
(Grant C. Miller, Advisory Architect)

Baumann & Baumann, Knoxville
Knoxville High School, Knoxville
Park City High School, Knoxville
Ausgin High School for Colored, Knoxville

D. R. Beeson, Johnson City
Jefferson School, Bristol, Va.
Elizabethton High School, Elizabethton
Radford High School, Radford, Va.

Coile & Cardwell, Johnson City
Library, State Teachers College, Johnson City
Martha Wilder School, Johnson City (Wm. B. Ittner, Consultant)
Gymnasium, Tusculum College, Tusculum

William Crutchfield, Chattanooga
Library, Du Bose Church Training School, Monteagle
Alton Park Elementary School, Chattanooga
Anna B. Lacey School, Hamilton County

Allen N. Dryden, Kingsport
Dobyns-Bennett High School, Kingsport
High School, Gate City, Va.
Church School, Rogersville

R. H. Hunt Co., Chattanooga (also Dallas, Texas)
McFarlin Memorial Auditorium, Southern Methodist University, Dallas, Texas
Training School, East Tennessee State Teachers College, Johnson City
Brainerd Junior High School, Chattanooga

Clarence T. Jones, Chattanooga
Clara Carpenter School, Chattanooga
Morristown High School, Morristown
Arnold Memorial School, Cleveland

Manley & Young, Knoxville
Administration Building, Tennessee Wesleyan College, Athens
Monroe County High School, Sweetwater
Harriman High School, Harriman

Estes W. Mann, Memphis
Paragould High School, Paragould, Ark.
Hughes High School, Hughes, Ark.
Forrest City High School, Forrest City, Ark.

Walter R. Nelson, Memphis
Dormitory, Blue Mountain College, Blue Mountain
High School, Baldwin, Miss.
North East Mississippi Junior College, Senatobia, Miss.

M. E. Parmelee, Knoxville
Gymnasium, Mars Hill College, Mars Hill, N. C.
Melrose Dormitory, same
Brown Dormitory, same

Regan & Weller, Memphis
Booker T. Washington Industrial School, Memphis
St. Agnes College Building, Memphis
Father Ryan High School, Nashville

W. H. Sears, Chattanooga
H. Clay Evans Grammar School, Chattanooga
Rhea Central High School, Dayton
Lookout Junior High School, Chattanooga

Gordon L. Smith, Chattanooga
Joseph E. Smith Elementary School, Chattanooga
Addition to Dickinson Junior High School, Chattanooga
North Chattanooga Colored School, Chattanooga

Tisdale & Pinson, Nashville
Science Hall, A. & I. State College, Nashville
Miles Memorial College, Birmingham, Ala.
Lincoln County High School, Fayetteville

TEXAS

Berry & Hatch, Amarillo
Paducah Grade School, Paducah
Friona High School, Friona
Turkey High School, Turkey

Arthur A. Brown, Dallas
State Home High School, Corsicana
Randolph College, Cisco
High School, Farwell

Bryan & Sharp, Dallas
Addition, Winnetka Grade School, Dallas
Hogg and Roberts Junior High Schools, Tyler
Roger Q. Mills Grade School, Dallas

Ralph H. Cameron, San Antonio
McAllen High School, McAllen
Sanderson High School, Sanderson
Carrizo Springs High School, Carrizo Springs

Guy A. Carlander, Amarillo
High School, Tulia
High School, Childress
Margaret Wills School, Amarillo

Lamar Q. Cato, Houston
George Washington Junior High School, Houston
Stonewall Jackson Junior High School, Houston
Woodrow Wilson Elementary School, Houston

W. G. Clarkson Co., Fort Worth
Stripling High School, Fort Worth
Masonic Home School, Fort Worth
North Fort Worth Junior High School, Fort Worth

DeWitt & Washburn, Dallas
Harlingen High School, Harlingen
Woodrow Wilson High School, Dallas (Associate Architects)
Mart High School, Mart

Leo M. J. Dielmann, San Antonio
Holy Ghost Convent, San Antonio
San Fernando Cathedral School, San Antonio
Library, Our Lady of the Lake College, San Antonio

Flint & Broad, Dallas
Lagow School, Dallas
Buckner Orphans Home High School, Dallas County
Wheatley School, Dallas

Giesecke & Harris, Houston (also Austin)
New group of buildings, Primary-Junior High School; Senior High School and Junior College, Edinburg
New unit, Senior High School, Austin
High School, Brenham

L. A. Glover, Houston
Miller Senior High School, Houston
John Reagan Senior High School, Houston
Jim Deady Junior High School, Houston

Herbert M. Greene, LaRoche & Dahl, Dallas
Laboratory Building, Medical College, Galveston
Garrison Hall, University of Texas, Austin
Biology Building, University of Texas, Austin

Hamon & Co., Corpus Christi
Odem High School, Odem
Three Rivers High School, Three Rivers
Ingle Side High School, Ingle Side

Hardy & Curran, Corpus Christi
Corpus Christi College, Corpus Christi
Corpus Christi Senior High School, Corpus Christi
Del Mar Grade School, Corpus Christi

Wyatt C. Hedrick, Inc., Fort Worth
Texas Technical College Group, Lubbock: Administration Building, Chemistry Building, Engineering Building (Wm. Ward Watkin, Houston, Associate Architect)

Kelwood Co., Inc., San Antonio
Brownwood Ward School, Brownwood
Los Fresnos School, Los Fresnos
Point Isabel School, Point Isabel

Kerr & Walsh, Amarillo
High School, Plainview
High School, Ralls
Ward School, Plainview

M. C. Kleuser, Dallas
Cuero High School, Cuero
N. W. Harllee School, Dallas
Junior High School, Stephensville

H. F. Kuehne, Austin
Six dormitories and Manual Training Building, Austin State School, Austin
Abernathy High School, Abernathy

Mark Lemmon, Dallas
Thomas Jefferson Junior High School, Port Arthur
Woodrow Wilson High School, Dallas (Associate Architect)
Robert E. Lee School, Port Arthur

Lindsey & Kilmer, Greenville
High School, Mineola
Grade School, Mineola
High School, Van

John M. Marriott, San Antonio
Ward School, San Antonio
Ward School, Laredo
Ward School, Corpus Christi

McLelland & White, Houston
Park Junior High School, Houston
Galena High School, Houston
Pasadena High School, Houston

Morris, Noonan & Wilson, San Antonio
Harlandale Junior High School, San Antonio
Morrill Elementary School, San Antonio
Highland Park School, San Antonio

Joseph W. Northrop, Jr., Houston
Educational Building, First Evangelical Church, Houston
Educational Building, Trinity Episcopal Church, Marshall
Vocational Building, Taylor School, Houston

Harry A. Overbeck, Dallas
Bowie School, Dallas
City Park School, Dallas
Julia C. Frazier School, Dallas

Page Bros., Austin
High School, Del Rio
High School, Eagle Pass
High School, Hearne

Harry D. Payne, Houston
Robert E. Lee Senior High School, Goose Creek, Independent School District
Bay City High School, Bay City Independent School District
Charles Bender High School, Humble Independent School District

Peters, Strange & Bradshaw, Lubbock and Big Spring
High School, Lubbock
High School, Silverton
High School, Ozona

Phelps & Dewees, San Antonio
Seven Junior High Schools, San Antonio
San Angelo Junior College, San Angelo
Brownsville High School, Brownsville

Rittenberry & Carder, Amarillo
Educational Building, Canyon State Teachers College, Canyon
High School, Spearman
High School, Dimmitt

Paul G. Silber & Co., San Antonio
High School, Alice
Educational Building, First Presbyterian Church, Beeville
Grant School, San Antonio

Shirley Simons, Lufkin (also Tyler)
Residential Hall, College of Industrial Arts, Denton
Auditorium-Gymnasium, Nacogdoches High School, Nacogdoches
Sulphur Springs Junior High School, Sulphur Springs

Harvey P. Smith, San Antonio
Alamo Heights Elementary and Junior High School, Alamo Heights, San Antonio
San Marcos High School, San Marcos
Dormitory, Lutheran Concordia College, Austin

Smith & Praeger, Paris
Paris Junior College, Paris
High School, Mt. Pleasant
Ward School, Paris

R. D. Steele, Houston
Sidney Lanier Junior High School, Houston
Jack Yates Colored High School, Houston
Southmore Elementary School, Houston

Maurice J. Sullivan, Houston
Convent of the Good Shepherd, Houston
James S. Hogg Junior High School, Houston (with B. P. Briscoe)
Jefferson Davis High School, Houston (with B. P. Briscoe)

W. A. Tackett & Sons Co., Abilene
High School, Bledsoe
High School, Gainesville
High School, Plano

Arthur E. Thomas, Dallas
High School, Crockett
High School, Carthage
York School, Dallas

Voelcker & Dixon, Wichita Falls
Zundelowitz Junior High School, Wichita Falls
High School, Olney
High School, Henrietta

R. Newell Waters, Weslaco
Lasara School, Lasara
Weslaco School, Weslaco
Mercedes School, Mercedes

Wm. Ward Watkin, Houston
Laboratory of Chemistry, Rice Institute, Houston
Six Junior and Senior High Schools, Houston
Texas Technological College Group, Lubbock

Witt, Seibert & Halsey, Texarkana (also Texarkana, Ark.)
Training School and Library (first unit) State Teachers College, Conway, Ark.
Public School System, Texarkana
Public School, Malvern

UTAH

Ashton & Evans, Salt Lake City
Irving Junior High School, Salt Lake City
Gymnasium and Auditorium, Payson
Gymnasium and Mechanical Arts Building, West Jordan and Riverton

Cannon & Fetzer, Salt Lake City
West High School, Salt Lake City
Grantsville High School, Grantsville
Central Building, University of Utah, Salt Lake City

Hodgson & McClenahan, Ogden
Washington Junior High School, Ogden
Lincoln Elementary School, Ogden
Polk Elementary School, Ogden

Lenord C. Neilson, Salt Lake City
Webster School, Magna
South Jordan School, South Jordan
Munay High School, Munay

Joseph Nelson, Provo
Heber J. Grant Library, Brigham Young University, Provo
Dixon Junior High School, Provo
Delta High School, Delta

Scott & Welch, Salt Lake City
South Senior High School, Salt Lake City
Utah State Training School, American Fork
Bingham High School, Bingham

R. C. Watkins, Salt Lake City
Fielding High School, Paris, Idaho
Grace High School, Grace, Idaho
Salina High School, Salina

VERMONT

Frank Lyman Austin, Burlington
Nazareth School, Burlington
Junior High School, Burlington
Shelburne High School, Shelburne

Arthur H. Smith, Rutland
Administration Building and Girls' Dormitory, State Normal Training School, Castleton
Grade School, Cavendish
Grade School, Florence

Walker & Walker, Montpelier
Spaulding High School addition, Barre
Alumni Hall, Norwich University, Northfield
Arlington School, St. Johnsbury

VIRGINIA

Fred A. Bishop, Richmond
Blackstone College for Girls, Blackstone
Hopewell High School, Hopewell
Dupont Elementary School, Hopewell

Calrow, Browne & Fitz-Gibbon, Norfolk
Larchmont School, Norfolk
George Rogers Clark School, Charlottesville
Currituck School, Currituck

Carneal, Johnston & Wright, Richmond
Group for Virginia Polytechnic Institute, Blacksburg
Group for Virginia Military Institute, Lexington

T. J. Collins & Son, Staunton
Memorial Hall, Staunton Military Academy, Staunton
Gymnasium and Swimming Pool, Augusta Military Academy, Fort Defiance
Gymnasium Building, Fairfax Hall, Waynesboro

Eubank & Caldwell, Inc., Roanoke
Forest Park School, Roanoke
Infirmary and Science Hall, Virginia Polytechnic Institute, Blacksburg
Science Hall, Roanoke College, Salem

Frye & Stone, Roanoke
Gymnasium, Roanoke College, Salem
Dormitory, State Teachers College, Farmville
Lucy Addison High School, Roanoke

S. J. Makielski, Charlottesville
Academic Building, Voorhees School, Denmark, S. C.
Dormitories and Trades Building, Voorhees School, Denmark, S. C.
Academic Building, St. Marys School, Memphis, Tenn.

G. R. Ragan, Roanoke
Unicoi County High School, Erwin, Tenn.
Morningside Grammar School, Roanoke
Rock Creek Grade School, Rock Creek, Tenn.

Charles M. Robinson, Richmond
Thomas Jefferson High School, Richmond
Williamsburg School, Williamsburg
Washington Hall and Library Building, College of William and Mary, Williamsburg

Louis Philippe Smithey, Roanoke
Wasena School, Roanoke
Addition to Jackson Junior High School, Roanoke
Addition to National Business College, Roanoke

WASHINGTON

Baker, Vogel & Roush, Seattle
Washington High School, Pasco
Factoria Grade School, King County
Federal Way School, King County

Bebb & Gould, Seattle
Group of eleven academic buildings and Library, University of Washington, Seattle
Washington State Normal School Group and Library, Bellingham
St. Nicholas Private School for Girls, Seattle

E. J. Breseman, Tacoma
Captain Robert Gray Junior High School, Tacoma
Morton High School, Morton
Randle Grade and High School, Randle

Chas. I. Carpenter, Spokane
New group of buildings, Ellensburg State Normal School, Ellensburg: Dormitories, Dining Hall, Library and Gymnasium

T. F. Doan, Bellingham
Washington School, Bellingham
Sunny Land School, Bellingham
Birchwood School, Bellingham

John Graham, Seattle
Physics Hall, University of Washington, Seattle
Aeronautics Hall, University of Washington, Seattle
Providence School of Nursing, Seattle

Hill, Mock & Morrison, Tacoma
Morton McCarver Intermediate High School, Tacoma
Reconstruction of Puyallup High School and addition to Junior High School, Puyallup
Clover Park Junior High School, Pierce County

Wm. Mallis, Seattle
Auburn High School, Auburn
Kent High School, Kent
Bremerton High School, Bremerton

John W. Maloney, Yakima
Franklin Junior High School, Yakima
Sunnyside Grade School, Sunnyside
Washington State Normal School, Ellenburg

F. A. Naramore, Seattle
James Monroe Junior High School, Seattle
McDermoth Elementary School, Aberdeen
Daniel Bagley Elementary School, Seattle

G. A. Pehrson, Spokane
Priest River School, Priest River
School of the Holy Ghost and St. Anthony, Spokane
Reardan School, Reardan

George M. Rasque, Spokane
Cheney High School, Cheney
Burns High School, Burns, Ore.
Lacrosse Junior-Senior High School, Lacrosse

Francis P. Rooney, Spokane
House of the Good Shepherd, Spokane
St. Johns Academy, Colfax
St. Patrick's School, Hilliard

Stanley A. Smith, College Architect, Pullman
Group of buildings, State College of Washington, Pullman: The Commons, Men's Gymnasium and Home Economics Building

Fred B. Stephen, Seattle
Edmonds Grade School, Edmonds
Port Townsend Junior High School, Port Townsend
Port Orchard High School, Port Orchard

Stephen & Brust, Seattle
Mt. Vernon High School, Mt. Vernon
Port Angeles High School, Port Angeles
Sedro Woolley High School, Sedro Woolley

Whitehouse & Price, Spokane
West Valley High School, Millwood
Arlington Grade School, Hillyard, Spokane
Russell Grade School, Moscow, Idaho

Jos. H. Wohleb, Olympia
William Winlock Miller High School, Olympia
Irene S. Reed High School, Shelton
Garfield Grade School, Olympia

WEST VIRGINIA

Albert F. Dayton, Wheeling
Boggs Grade School, Benwood
McMechen Grade School, McMechen
Union High School Annex, Benwood

Levi J. Dean, Huntington
Rome High School, Rome, Ohio
Guyan Valley High School, Branchland
Wahama High School, Mason

William Francis Diehl, Huntington
Douglas Senior and Junior High School, Huntington
Grant High School, Grant District, Cabell County, Milton
Barboursville High School, Barboursville

Frederic Faris, Wheeling
Madison School addition, Wheeling
West Liberty State Normal School, West Liberty
Elm Grove Grade and Junior High School, Elm Grove, Wheeling

S. W. Ford, Clarksburg
Mannington High School, Mannington
Bridgeport High School, Bridgeport
Eagle District High School, Lumberport

Frampton & Bowers, Huntington
Martinsburg High School, Martinsburg
High School, Pineville
Harper's Ferry High School, Harper's Ferry

Edward Bates Franzheim, Wheeling
Warwood High School, Wheeling
Chemistry Building, Bethany College, Bethany
Colored Grade School, Triadelphia

Garry & Sheffey, Bluefield
Institute Grade School, Beckley
Bramwell Grade School, Bramwell
Ramsey Junior High School, Bluefield

E. C. Holmboe, Clarksburg
Kelley Miller High School, Clarksburg
Washington Irving High School, Clarksburg
Charles Town High School, Charles Town

Alexander B. Mahood, Bluefield
Welch High School, Welch
Beaver High School, Bluefield
Classroom and Administration Building, Bluefield Institute, Bluefield

Meanor & Handloser, Charleston
Cammack Junior High School, Huntington
Marshall College Library, Huntington
Dormitories, Morris Harvey College, Huntington

Carl Reger, Morgantown
Upshur County High School, Buckhannon
Agnes Howard Hall, West Virginia Wesleyan College, Buckhannon
St. Peters R. C. Parochial School, Fairmont

Edward J. Wood & Son, Clarksburg
Sutton High School, Sutton
Weston Grade School, Weston
Flemington High School, Flemington

Wysong, Bengston & Jones, Charleston
Union School, Charleston
High School, Montgomery
Ronceverte High School, Ronceverte

WISCONSIN

N. P. Backes, Milwaukee
St. Elizabeth School, Milwaukee
Holy Cross School, Milwaukee
St. John's School, Marshfield

Balch & Lippert, Madison
Three buildings, Winnebago Indian School, Neillsville
Religious Educational Building, Swiss Reformed Church, New Glarus

Peter Brust, Milwaukee
Mercy High School, Milwaukee
Holy Redeemer School, Milwaukee
Mission School, Tsingtao, China

Eschweiler & Eschweiler, Milwaukee
St. Jerome's School, Oconomowoc
St. Thomas Aquinas School, Milwaukee
Lake Bluff Grade School, Shorewood

Flad & Moulton, Madison
St. Mary's School, Janesville
St. Joseph's School, Racine
Nakoma School, Madison

Foeller, Shober & Berners, Green Bay
East Side High School, Green Bay
Vocational School, Green Bay
Port Washington High School, Port Washington

Edward J. Hancock, Eau Claire
High School, Eau Claire
High School, Whitewater
Grade School, Chippewa Falls

Herbst & Kuenzli, Milwaukee
Mount Mary College Group, Milwaukee
Wauwatosa High School Group, Wauwatosa
Shorewood High School Group, Shorewood

Frank J. Hoffman, Racine
Vocational School, Racine
Sturtevant Grade School, Sturtevant
St. Rose Parochial School, Racine

Ferd. L. Kronenberg, Madison
Addition to Emerson School, Madison
St. Peter's School, Beaver Dam
St. Xavier School, Cross Plains

Law, Law & Potter, Madison
West High School, Madison
Western Avenue School, Janesville
Ringold Grade School, Janesville

Lindl & Schutte, Inc., Milwaukee
St. Vincent's Parochial School, Oshkosh
Washington High School, West Allis
Woodrow Wilson Grade School, West Allis

Otto A. Merman, La Crosse
High School, Cashton
Beloit Vocational School, Beloit
La Crosse Vocational School, La Crosse

Oppenhamer & Obel, Green Bay
Central School, Wausau
High School, Burlington
High School, Sheboygan Falls

Parkinson & Dockendorff, La Crosse
Junior High School, South Milwaukee
Junior High School, Waukesha
Catholic Central High School, La Crosse

Arthur Peabody, Madison
Memorial Union, University of Wisconsin, Madison
Service Memorial Institutes (medical laboratory), Madison
Practice School, State Normal School, Oshkosh

Mark F. Pfaller, Milwaukee
Addition to St. Agnes Church and School Building, Milwaukee
St. Dominic's School, Sheboygan
St. Anthony's School, Milwaukee

William J. Raeuber, Manitowoc
St. Paul's School, Manitowoc
St. Boniface School, Manitowoc
St. Andrew's School, Manitowoc

Charles Clark Reynolds, Green Bay
West Senior High School, Green Bay
Menekaunee Elementary School, Marinette
De Pere High School, De Pere

Smith & Brandt, Manitowoc
Kiel Grade and High School, Kiel
Adams-Friendship High School, Adams
Cunningham Elementary School, Beloit

Edward F. Starck, Madison (formerly Claude & Starck)
Franklin School, Madison
Baraboo High School, Baraboo
Evansville High School, Evansville

Frank J. Stepnoski, Fond du Lac
St. John's Catholic School, Little Chute
Lincoln Junior High School, Fond du Lac
St. Peter's Ev-Luth School, Beaver Dam

Edward Tough, Madison
Dudgeon Grade School, Madison
Randall Junior High School, Madison
Watertown High School addition, Watertown

Martin Tullgren & Sons, Milwaukee
West Milwaukee High School, West Milwaukee
Humboldt Avenue Public School, Whitefish Bay
Whitefish Bay High School, Whitefish Bay

Thomas S. Van Alyea, Milwaukee
St. Johns Military Academy, Delafield:
Memorial Chapel
Hazel Wood Hall
Smythe Hall

Van Ryn & De Gelleke, Milwaukee
Central Vocational School, Milwaukee
Milwaukee University School, Milwaukee
Science Hall, Milwaukee-Downer College, Milwaukee

Carl Volkman, Eau Claire
High School, Bloomer
St. Charles Parochial School, Chippewa Falls
St. Patrick's Parochial School, Eau Claire

Guy E. Wiley, Milwaukee
Lincoln High School, Milwaukee
Auditorium, Boys' Technical High School, Milwaukee
Humboldt Park Elementary School, Milwaukee

WYOMING

Wilbur A. Hitchcock, Laramie
Laramie High School, Laramie
Men's Dormitory, University of Wyoming, Laramie
Lusk High School, Lusk

CANADA

ALBERTA

W. A. Branton, Calgary
Crescent Heights High School, Calgary
Western Canada High School, Calgary
Technical High School, Calgary

E. T. Brown, Calgary
Lethbridge Collegiate School, Lethbridge
Hanna High School, Hanna
Kamloops High School, Kamloops, B. C.

Edward Underwood, Edmonton
St. Joseph's Catholic University College, Edmonton
St. Edmunds R. C. Separate School, Edmonton
St. Alphonsus R. C. Separate School, Edmonton

BRITISH COLUMBIA

Bowman & Cullerne, Vancouver
Norquay School, Vancouver
Chilliwack City School, Chilliwack
Gilmore Avenue School, Burnaby

Harry W. Postle, Architect to Vancouver Board of School Trustees, Vancouver
Vancouver Technical High School, Vancouver (Administration and Academic Building, Auditorium and Gymnasium)
Sir Mathew Begbie School, Vancouver

Sharp & Thompson, Vancouver
University of British Columbia group, Vancouver: Science and Library Group; Anglican Theological College; new Tower and Library addition

MANITOBA

Arthur A. Stoughton, Winnipeg
Arts, Science and Engineering Buildings, University of Manitoba, Winnipeg

MARITIME PROVINCES

Leslie R. Fairn, Wolfville, N. S.
High School, New Glasgow, N. S.
Kings County Academy, Kentville, N. S.
Pictou Central School, Pictou, N. S.

C. A. Fowler & Co., Halifax, N. S.
Sir Charles Tupper School, Halifax
St. Patrick's Girls' School, Halifax
Nova Scotia Training School, Truro

Major H. E. Gates, Halifax, N. S.
Pathological Institute, Halifax, N. S.
Victoria General Hospital and Medical School of Dalhousie University (for instruction jointly), Halifax, N. S.

H. Claire Mott, Saint John, N. B.
Department of Forestry and Geology, University of New Brunswick, Fredericton
Library Building, University of New Brunswick, Fredericton
Provincial Normal School, Fredericton

ONTARIO

Allaster & Jacques, Windsor
St. Angela R. C. School, Windsor
High School, Athens
St. Claire R. C. School, Windsor

S. B. Coon & Son, Toronto
Vocational School, North Bay
Vocational School, Oshawa
Etobicoke High School, Islington

Craig & Madill, Toronto
Pembroke Collegiate Institute, Pembroke
Earl Haig High School, Township of North York
Agincourt Continuation School, Agincourt

G. Roper Gouinlock, Toronto
Collegiate Institute and Vocational School, Brockville
East York High School, Toronto
Port Credit High School, Toronto

Hutton & Souter, Hamilton
Delta Collegiate Institute, Hamilton
Cathedral High School, Hamilton
Oshawa Collegiate School, Oshawa

B. A. Jones, Kitchener
College for Congregation of the Resurrection, North Bay
Sheppard Public School, Kitchener
St. John's (separate) School, Kitchener

Albert J. Lothian, Windsor
Assumption College, Classroom Building, Sandwich
St. Bernard School, East Windsor
St. Joseph School (public school), Ford City

Nichols, Sheppard and Masson, Windsor
John Campbell Public School, Windsor
Gordon McGregor Public School, Ford City
Hugh Beaton Public School, Walkerville

E. H. Paisley, Toronto
St. Andrews College (for boys), Aurora
Ridley College—Lower School for Boys, St. Catherines
St. Andrews College—Lower School, Aurora

Pennington & Boyde, Windsor
Walkerville Collegiate Institute, Walkerville
Havry Guppy School, Windsor
Ford Public School, East Windsor

Richards & Abra, Ottawa
St. John's Separate School, Perth
Winchester Public School, Winchester
Broadway Avenue Public School, Westboro

William Lyon Somerville, Toronto
McMasters University Group, Hamilton: University Hall, Science Building, Men's Residence, Women's Residence, Refectory
(J. Francis Brown & Son, Toronto, Associate Architects)

Sproatt & Rolph, Toronto
Emanuel College, Victoria University, Toronto
Bishop Strachan School, Toronto
Upper Canada Lower School, Toronto

Toronto Board of Education, Architects' Department, Toronto
Western Technical-Commercial School, Toronto
Duke of York Elementary School, Toronto
Eastern High School of Commerce, Toronto

F. W. Warren, Hamilton
W. H. Ballard Public School, Hamilton
West Hamilton School, Hamilton
Saltfleet High School, Stoney Creek

QUEBEC

Louis N. Audet, Sherbrooke
Seminary, Three Rivers
(Asselin & Denoncourt, Associate Architects)
St. Mary Academy, Sherbrooke
St. Michael's Academy, Chatham, N. B.

David R. Brown, Montreal
Chemistry Building, University of Saskatchewan, Saskatoon, Saskatchewan
Field Husbandry Building, University of Saskatchewan, Saskatoon, Saskatchewan
Rosemount School, Montreal

Alcide Chaussé, Montreal
Convent, Granby
Stadacona School, Montreal
College, Maniwiki

Chas. David, Montreal
Holy Cross School, Montreal
St. Etienne School, Montreal
Laboratories, Ecole Polytechnique, University of Montreal, Montreal

J. Raoul Garièpy, Montreal
Cartierville School, Montreal
Cornwall School, Cornwall, Ont.
St. Scholastic Convent, St. Scholastique

Gordon & Thompson, Montreal
West Hill High School addition, Montreal
Willingdon School, Montreal (Consulting Architect)
Barclay School, Montreal

Anastase Gravel, Verdun
Ecole Maternelle, Verdun
Couvent de Rigaud, Rigaud
Ecole Notre-Dame de Lourdes, Verdun

Lamontagne, Gravel & Brassard, Chicoutimi
Couvent des Petites Franciscaines, Chicoutime
Ecole Industrielle, Chicoutime
Ecole Industrielle, Malbaie

Pierre Lèvesque, Quebec
Seminary of Gaspé, Gaspé
Agricultural School, Rimouski
Ursulines Convent, Gaspé

Nobbs & Hyde, Montreal
Pulp and Paper Research Institute, McGill University, Montreal
Henry J. Garritty School, Verdun
Royal Victoria College Extension, McGill University, Montreal

J. Aime Poulin, Sherbrooke
Ste. Therese School, Sherbrooke
Catholic High School, Drummondville
St. Maurice College, Thetford Mines

C. A. Reeves, Montreal
Academie du St. Nom de Marie, Montreal
Academie de Lasalle, Montreal
Academie Jeanne d'Arc, Montreal

Richer & Bournet, St. Hyacinthe
Seminary of St. Hyacinthe, St. Hyacinthe
Mercier School, St. Hyacinthe
Larocque School, St. Hyacinthe

Eugene St. Jean, Montreal
Ste. Cecile School, Montreal
(J. Albert Larue, Outremont, Associate Architect)
St. Vincent-Ferrier School, Montreal
(J. Albert Larue, Outremont, Associate Architect)
St. Gerard School, Montreal

Joseph Sawyer, Montreal
Seminaire de Mont Laurier, Mont Laurier
Ecole Saint Louis de Gonzague, Montreal
Ecole Normale, for RR. SS. Grises de la Croix, Ville Marie

D. J. Spence, Montreal
Catholic High School, Montreal
Sacred Heart Convent School, Montreal
Sacred Heart Convent School, Sault au Recolet

SASKATCHEWAN

Frank P. Martin, Saskatoon
Pleasant Hill School, Saskatoon
City Park Collegiate School, Saskatoon
Victoria School addition, Saskatoon

F. H. Portnall, Regina
Thomson Public School, Regina
Davin Public School, Regina
Maple Leaf Hostel, St. Chads College, Regina

Puntin, O'Leary & Coxall, Regina
St. Augustine School, Regina
Holy Rosary School addition, Regina
Lakeview School addition, Regina

W. G. Van Egmond and Stan. E. Storey, Regina
Balfour Technical School, Regina
Collegiate Institute, Regina
Normal School, Regina

See also Landscape Architects for University and School Projects, pages **534-535.**

DESIGN AND CONSTRUCTION OF BUILDINGS

This subject was represented in last year's edition of The American School and University, by the following articles:

Selecting an Architect
By William Orr Ludlow, Ludlow & Peabody, Architects

What Shall We Tell the Architect?
By Murray A. Dalman, Educational Consultant, Perkins, Chatten & Hammond, Architects

Pittsburgh's Forty-Story "Cathedral of Learning"
By John Weber, Business Manager and Supervising Engineer, University of Pittsburgh

Recent Tendencies in School Architecture in Germany
By Werner Hegemann, Editor, *Städtebau*, Berlin, Germany

Steel Joist Floor and Roof Construction for School Buildings
By Tyler Stewart Rogers

The Broadcasting Plant of a State College
By Edwin T. Reed, Editor of Publications, Oregon State College

Suitable Radio Equipment for Schools
By J. L. Clifton, Director of Education, State of Ohio

Better Illumination and Electrification for School Buildings by the Adoption of Standards
By Carl F. Wolf, Illuminating and Electrical Engineer, Valley Electrical Supply Company, Merchandising Division of The San Joaquin Light & Power Corporation, Fresno, Calif.

Costs of Nine New School Buildings in Newton
By Cecil C. Chadwick, Public Buildings Commissioner, Newton, Mass.

Modern Schools in South America
By H. Errol Coffin, of Coffin & Coffin, Architects; Consulting Architect to the Republic of Chile

Ramps versus Stairways in School-Building Construction
By F. W. Hart, Professor of Education, University of California

Acoustical Treatment in the School and University
By John S. Parkinson, Staff Acoustical Engineer, Johns-Manville Corporation

Central Heating Plants for Universities
By G. B. Nichols, Mechanical Engineer

Prize-Winning Entries in the 1929 Common Brick Schoolhouse Competition

The New Central Catholic High School, Toledo, Ohio
By Rev. R. G. Kirsch, Principal

Structural and Decorative Possibilities of Concrete Construction
By Wyatt Brummitt, Portland Cement Association

Selecting a Site and Planning a Junior-Senior High School Building for a Growing Village
By N. L. Engelhardt, Professor of Education, Teachers College, Columbia University

How Sanitary Drinking Fountains Should Be Made and Operated
Committee Report of the American Public Health Association

Section XV

LANDSCAPE ARCHITECTS
FOR UNIVERSITY AND SCHOOL PROJECTS

The following directory is restricted to fellows or members of the American Society of Landscape Architects who are in independent professional practice and have actually been identified with a number of university or school projects.

Space limitations permit only three listings for each individual or firm, and preclude mentioning either the name of the architect associated or the definite character of the work undertaken for each institution. It is believed that the majority of landscape architects specializing in school and university work are here represented, and that many of the projects listed have had a considerable influence on high-grade professional practice in the planning and planting of school grounds and college campuses throughout the United States.

ALABAMA

R. J. Pearse & Associates, Birmingham
University of Mississippi, Oxford, Miss.
East Mississippi Junior College, Scooba, Miss.
Roosevelt High School, Des Moines, Ia.

CALIFORNIA

Stephen Child, San Francisco
Lowthorpe School of Landscape Architecture for Women, Groton, Mass.
Convalescent Home, Children's Hospital, Wellesley, Mass.
State Normal School, Teachers College, San Jose

Cook, Hall & Cornell, Los Angeles
Pomona College, Claremont
Claremont Colleges, Claremont
University of Hawaii, Honolulu

Charles H. Diggs, Los Angeles
Georgetown University Preparatory School, Washington, D. C.
Mount Vernon Seminary, Washington, D. C.
University of Southern California, Los Angeles

Frederick N. Evans, Sacramento
Sacramento Junior College Campus, Sacramento
Sacramento Public Schools Grounds, Sacramento
Woods Grammar School, Woodbridge

Howard Gilkey, Oakland
Santa Rosa Junior College, Santa Rosa
St. Mary's College, Moraga
Modesto Junior College, Modesto

John William Gregg, Berkeley and Los Angeles
Campus development for the University of California at Berkeley, Los Angeles, Riverside and Davis

McKown and Kuehl, Beverly Hills
Iowa State Teachers' College, Cedar Falls, Iowa
Public Schools, Davenport, Iowa
Huntington Beach Union High School, Huntington Beach

Emanuel Tillman Mische, Los Angeles
Warren G. Harding High School, Sawtelle
El Segundo High School, El Segundo
Beverly Hills High School, Beverly Hills

L. Deming Tilton, Santa Barbara
University of Illinois, Urbana, Ill.
State Teachers College, Santa Barbara
Saint Anthony's College, Santa Barbara

Paul G. Thiene, Los Angeles
Alhambra High School, Alhambra
Santa Maria Union High School, Santa Maria
Excelsior Union High School, Norwalk

COLORADO

S. R. DeBoer & Co., Denver
University of Denver, Denver
Colorado Woman's College, Denver
The Idaho Technical Institute, Pocatello, Idaho

McCrary & Culley, Denver
New Mexico Military Institute, Roswell, N. Mex.
University of Wichita, Wichita, Kans.
University of Wyoming, Laramie, Wyo.

CONNECTICUT

Thomas H. Desmond & Associates, Inc., Simsbury
Westminster School, Simsbury
Miss Porter's School, Farmington
Ethel Walker School, Simsbury

FLORIDA

Frank M. Button, Coral Gables
University of Vermont, Burlington, Vt.
Ponce de Leon High School, Coral Gables
Millikin University, Decatur, Ill. (Partner of Simonds Co.)

ILLINOIS

Jacob L. Crane, Jr., Chicago
Lawrence College Campus, Appleton, Wis.
High School Campus, Ponca City, Okla.
Chicago Board of Education (64 schools)

Chance S. Hill, Chicago
North Central College Campus, Naperville
Downers Grove Community High School, Downers Grove
Wheaton Community High School, Wheaton

Simonds & West, Chicago
Iowa State College, Ames, Iowa
Illinois College, Jacksonville
University of Maryland, College Park, Md.

F. A. Cushing Smith & Associates, Chicago
High School Group, Shorewood, Milwaukee, Wis.
St. Joseph's Seminary, Hinsdale
Glenwood Manual Training School, Glenwood

INDIANA

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Purdue University, Lafayette
St. Mary of the Woods Academy, Terre Haute
Shortridge High School, Indianapolis

IOWA

Philip H. Elwood, Jr., Ames
State University of Iowa, Iowa City
State School for the Deaf, Council Bluffs
Dorothy Love Presbyterian Home, Sidney, Ohio

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Mabel Keyes Babcock, Boston
Wellesley College Campus, Wellesley
Massachusetts Institute of Technology, Cambridge
Bates College, Lewiston, Maine

Robert Washburn Beal, Boston
Brockton High School, Brockton
Bowdoin College, Bowdoin Athletic Field, Brunswick, Maine
High School Campus and Athletic Field, Whitman

Harold Hill Blossom, Boston
Beaver Country Day School, Brookline
Amherst College, Amherst
Dedham High School, Dedham

Herbert J. Kellaway, Boston
Amherst College, Amherst
Andover Theological Seminary, Cambridge
Hartford Theological Seminary, Hartford, Conn.

Warren H. Manning Offices, Inc., Cambridge
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Western Reserve University, Cleveland, Ohio
North Carolina State College, Raleigh, N. C.

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University of Buffalo, Buffalo, N. Y.
Dalton High School, Dalton
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John Nolen, Cambridge
Babson Institute, Wellesley
Queens College, Charlotte, N. C.
University of Wisconsin, Madison, Wis.

Olmsted Brothers, Brookline
Phillips Academy, Andover
Denison University, Granville, Ohio
Duke University, Durham, N. C.

Bremer Whidden Pond, Boston
University of New Hampshire, Durham, N. H.
Southern Methodist University, Dallas, Texas
Radcliffe College, Cambridge

William H. Punchard, Boston
Middlebury College, Middlebury, Vt.
Abbot Academy, Andover
Woburn High School Athletic Field, Woburn

Arthur A. Shurcliff, Boston
Amherst College, Amherst
Wellesley College, Wellesley
Mount Holyoke College, South Hadley

Stiles & Van Kleek, Boston
Williams College (golf course), Williamstown
Tufts College (golf course), Medford
Taft School (golf course), Watertown, Conn.

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Sacred Heart Seminary, Detroit
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Starr Commonwealth for Boys, Albion
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Hillsdale Public Schools, Hillsdale
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Carleton College, Northfield, Minn.

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Three camp site developments, Minneapolis Y. M. C. A., Minneapolis

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University of Kansas, Lawrence, Kans.
High School Campus, Longview, Wash.
8 Senior and Junior High Schools, Houston, Texas

John Noyes, St. Louis
New Mary Institute, St. Louis County
Washington University, St. Louis
Westminster College, Fulton

NEW JERSEY

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Fieldston School Campus, New York City
Tenafly High School Grounds, Tenafly
Roosevelt Common Athletic Field, Tenafly

NEW YORK

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(also Charleston, S. C.)
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Memorial High School, Pelham
Prospect Hill School, Pelham Manor

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Bronxville Schools, Bronxville
Tuckahoe High School, Tuckahoe

Brinley & Holbrook, New York
Columbia High School, Maplewood, N. J.
Tuscan School, Maplewood, N. J.
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New York State College of Forestry, Syracuse
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High School, Shaker Heights
High School, Cleveland Heights

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Pennsylvania State College, State College, Pa.
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Scarsdale High School, Scarsdale, N. Y.
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The distributors whose cards appear on this and following pages are of two types—laboratory supply houses and firms dealing in classroom equipment. The latter, in most instances, carry a listing of the principal manufacturers whom they represent. All of the distributors, however, maintain stocks of educational equipment or laboratory supplies for efficient service to the territories covered by them. For convenience in locating the distributors of any particular region the cards have been arranged geographically by sections, commencing with New England and concluding with the Pacific Coast States.

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Weber Costello Co.	Blackboard Products
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SERVICISED ENGINEERS AND SERVICISED LABORATORIES, INC., will gladly cooperate in the development of materials for more economical and more permanent school construction.

The architectural problems involved in our half a billion dollar annual school construction program nowhere have more skillful attention than that given by the American architect. And no one appreciates more that, aside from design, the selection of materials for adaptability, durability and for waterproofing and damp proofing of walls, roofs, walks and floors is of supreme importance.

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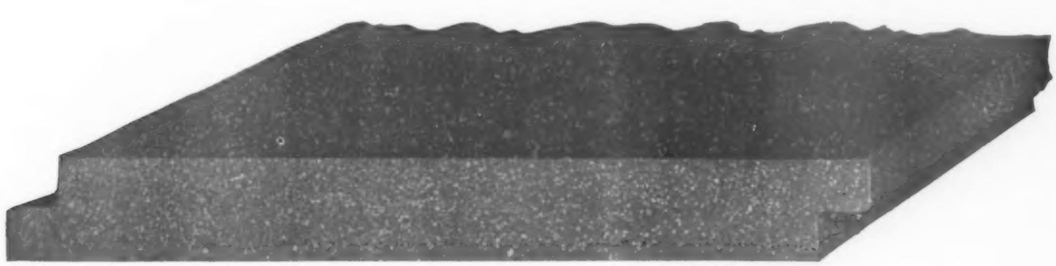
Insulating Material
Matting, Rubber
Paper, Building, Roofing
Roofing Asphalts
Roofing Felts
Roof Insulation
Roofs Built-Up, Bonded
Rubber Flooring, Matting
Rubber Stair Treads
Rubber Tile
Sound Absorbing Materials
Traffic Markers and Guides, Rubber



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Modern efficiency requires hygienic comfort. The AUTO-MATRON and VEND-A-FEM models of Sanitary Napkin Dispensing Machines fill a long-felt, though long-suppressed want. Schools are accepting these machines on a larger scale year by year. That these two models have outstanding superiority over others on the market is demonstrated not only by the long list of our clients but also by the fact that many of these clients took out another model in order to replace it with one of these more up-to-date, more practical and better-appearing machines.

Three prominent makes of sanitary napkins are made by this company and dispensed by our machines: FEMS, GARDS and SAFON, the first two released each with two safety pins; the third type with a tape string and attachment grip, requiring no belt or pins.

The Auto-Matron

This is the most modern machine of all — foolproof — troubleproof—a coin releasing a napkin every time. It can be had with a 5¢ or a 10¢ release. A register at the side shows the number of napkins in the machine at any time. When the word "Empty" appears, the coin is returned. This is an exclusive feature.

A drop door opening at the top is locked with an Eagle lock, in this way protecting the contents.

The machine is filled in the simplest way. As the napkins are released by a coin, one shelf after another drops. When empty, all shelves or trays are suspended downward. Palming them upward with one swish of the hand makes each tray catch again—and the napkins in envelopes are inserted, one on each shelf or tray.

Size: 31½ x 12¾ x 5½ inches, capacity 24 napkins.
Finish: pure white porcelain drop door with olive-trim cabinet, or pure white porcelain-Duco on both drop door and cabinet, also in orchid, French gray, Nile green and yellow.

The Vend-a-Fem

This machine is finished in pure white porcelain with trimming and coin box of highly polished nickel plate. It is constructed of solid sheet steel, all parts die-cast and interchangeable. The coin box is fitted with a Yale lock and the top with a Corbin lock, thus preventing petty thefts. Like the AUTO-MATRON, it can be had with either a 5¢ or a 10¢ release. The machine is easily and quickly refilled. In this model, napkins and pins are dispensed in a tube, instead of flat, as in the AUTO-MATRON.

This machine comes in several sizes: The VEND-A-FEM "JUNIOR," 32½ x 3¾ x 3½ inches exclusive of width of coin box, capacity 18 napkins; the VEND-A-FEM "DOUBLE," 32½ x 7½ x 3½ inches (exclusive of coin box), capacity 32 napkins; and the economical "UNIT E" model, 33 x 4½ inches, with a depth of 6 inches including coin box, capacity 12 napkins.

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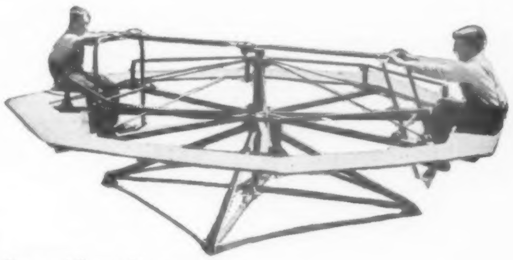
What Makes It Go?

A little effort on the operating bars sets the machine in motion, and away you go for a thrilling ride. An ingenious device amazing in its simplicity permits the machine to be operated from the pump handles while you ride. It is wonderful exercise. The same muscles are called into play as in rowing.

We invite comparison with any other equipment on the market today, in **type of construction, durability, safety** and **popularity.**



Specifications

- Constructed of structural steel with the exception of seats, which are of the best grade of lumber
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- Timken bearings below and plain bearing above on 8- and 10-foot machines; Timken below and Hyatt above on the 12-foot, 16-foot and water machines
- All machines full guaranteed
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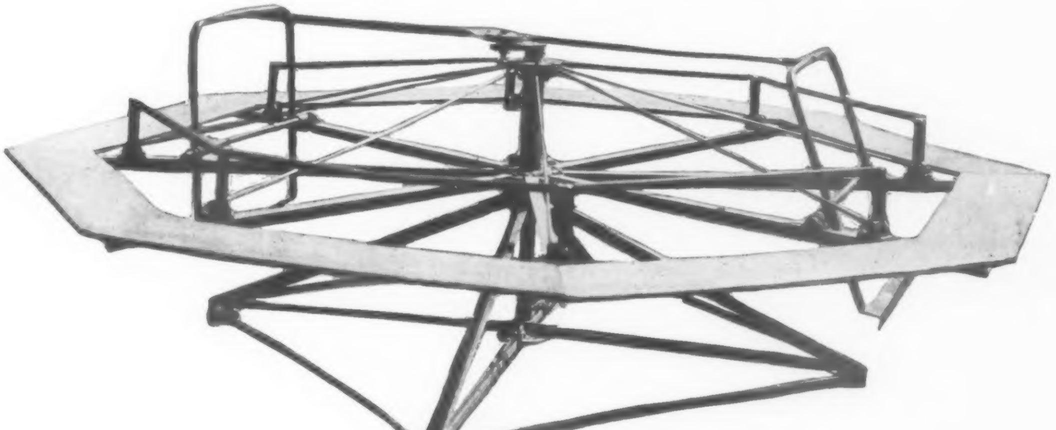
Write us for further information regarding this safe and delightful piece of apparatus for your school playground, swimming pool, beach or park.



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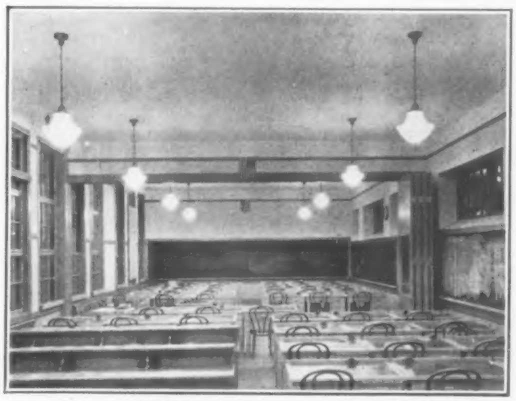

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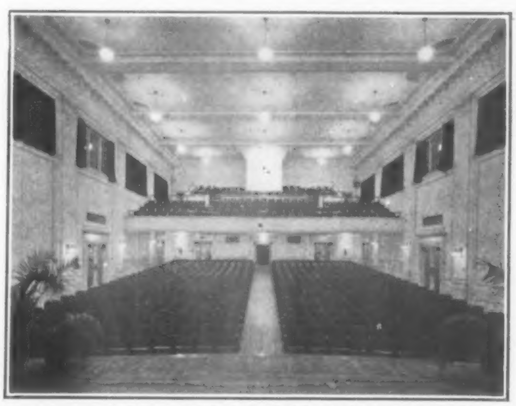

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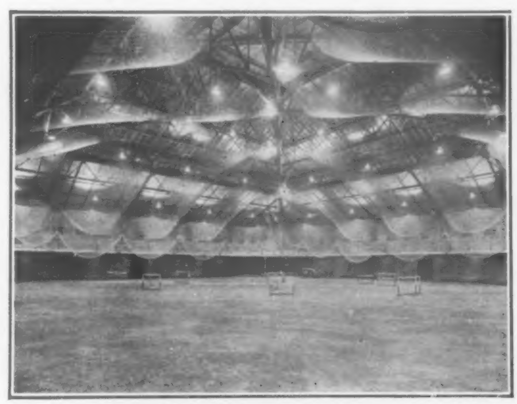

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HYGEIA FILTER COMPANY

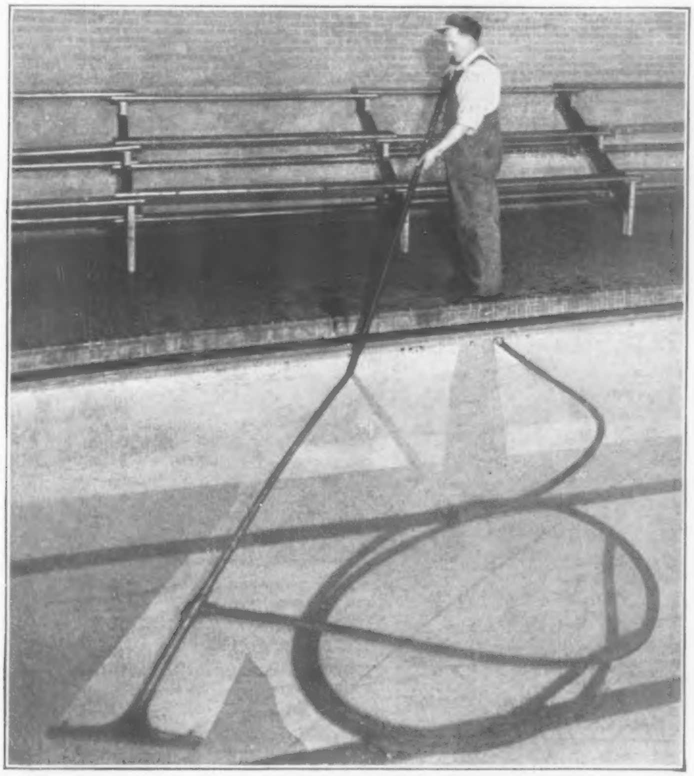
3422–40 Denton Ave., Detroit, Michigan

HYGEIA POOL CLEANER

SAVES WATER

SAVES TIME

SAVES LABOR



THE HYGEIA POOL CLEANER IN OPERATION

Pool cleaners are very necessary in keeping a pool clean. Dust blows in, dirt is tracked in by swimmers. Hair, cuticle and other foreign matter is constantly washed loose, to form a slimy film in a short time.

The Hygeia Pool Cleaner brings the pool owner the final needed equipment for perfect sanitation. It combines economy with ease of operation, and the bottom of the pool can be easily and quickly cleaned whenever necessary.

To empty an average size swimming pool costs, in water alone, about $50 and without a good pool cleaner this is necessary at least twelve times a year. With a Hygeia Pool Cleaner the number of times can be reduced to three or four—a saving of $400 in water alone!

The Hygeia Pool Cleaner is of the suction type and has many exclusive features, including a smooth-jointed handle and positive brush adjustment. Write at once for complete details.

Hygeia also manufactures a complete line of Water Filters for recirculation, Pool Fittings and Hair and Lint Catchers. Write for information on your requirements.

VOGEL-PETERSON CO., INC.

1811 North Lincoln St., Chicago, Ill.

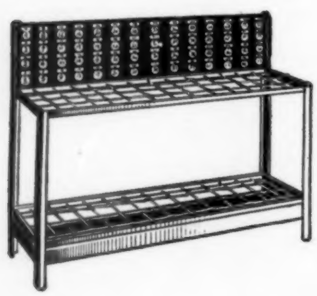
A RACK FOR EVERY PURPOSE

Providing Maximum Capacity in Minimum Space

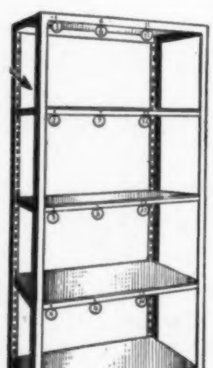
Peterson All-Steel Checkroom Equipment

Peterson Checkroom Racks meet every checking requirement of the modern school building. They are operated by an exclusive "One-Check System" which insures accuracy and speed in the checking of coats, hats and accessories. They insure proper care of garments checked and are appreciated especially by those users who realize the shortcomings of old-fashioned checking methods. In point of cost, Peterson units are actually less expensive than ordinary racks.

The Portable Rack (above) is 6′ 7″ high and 2′ wide. It has 48 hat compartments and 48 hangers. It is mounted on large rubber ball bearings casters, and can be assembled easily or knocked down without the aid of any tools. Stationary Racks of similar construction, with legs which are screwed to the floor, are furnished in lengths of 4′ and more with a capacity of 8 hangers and hat spaces to every lineal foot of rack. We also supply Wall Racks.



ONE CHECK *IDENTIFIES* HAT, COAT, UMBRELLA, OVERSHOES, PARCELS, ETC.

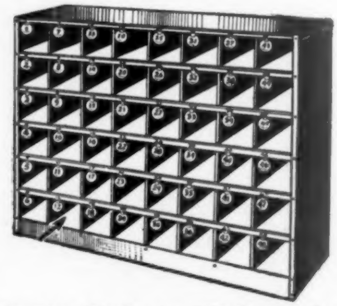


Umbrella Racks, 1′ wide, and 3″ high to top of backboard, are furnished in lengths of 1′ 6″ and more. They have a capacity of 16 umbrellas or canes to each 1′ length. The drip pan has a pet-cock for draining.

The "One-Check System" is simplicity itself. Although a guest may check several items—coat, hat, umbrella, overshoes, luggage, etc., he receives only one check, which serves to identify them all.

Our catalog shows the full line of Peterson Checkroom equipment, and a copy will be sent you upon request.

The Peterson Checking System is fully protected by U. S. Patent No. 1,658,252.



Overshoe Racks are 15″ deep and are usually supplied in counter height to accommodate 24 or more pairs of overshoes. Each compartment measures 6″ x 6″ x 15″. Sturdily constructed of heavy gauge steel, handsomely enameled.

Baggage Racks, 84″ high and 24″ deep, are furnished in 3′ sections with a capacity of 15 suitcases to each section. Shelving is adjustable. Backs and sides supplied if desired.

To parties interested in efficient checkrooms we shall gladly submit proposed layouts either for the modernizing of old checkroom or for the arrangement of new ones. In order to make these recommendations intelligently, we require room measurements, locations and sizes of windows, doors and radiators, and capacity desired.

CARTER BLOXONEND FLOORING CO.

902 Walnut Street, Kansas City, Mo.

BRANCH OFFICES IN LEADING CITIES

Manufacturers and Installers of

BLOX-ON-END FLOORING

Lay's Smooth Stay's Smooth

Genuine BLOXONEND is a Composite End-Grain Floor Laid in 8-Foot Strips and Splined Together

FOR GYMNASIUMS — SCHOOL SHOPS

The installation method shown below has been used in laying millions of feet of Genuine BLOXONEND in school and university gymnasia. It is possible to obtain practically any required degree of resiliency —an exclusive BLOXONEND advantage. In shop, corridor, cafeteria and other service where utmost resilience is not important, the flooring is laid directly on subfloor without pitch or other adhesives.

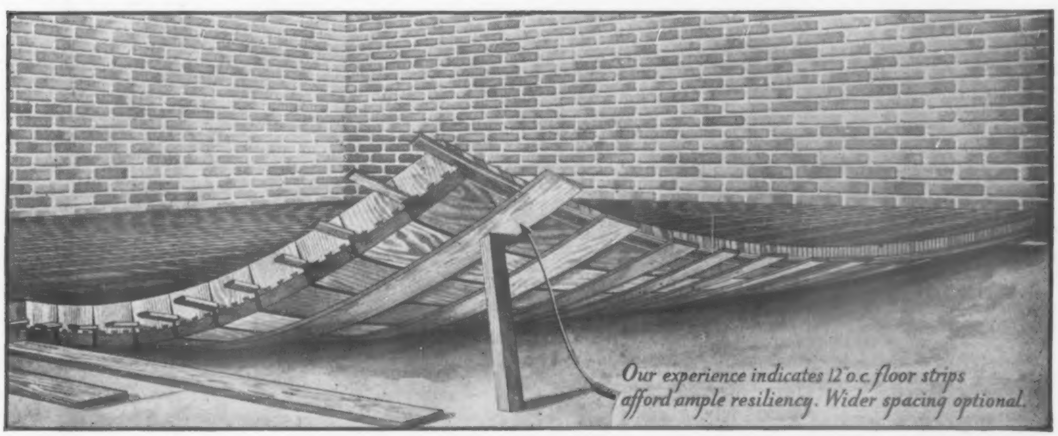
No Slivers Possible

The end-grain fibres form the surface of BLOXONEND eliminating the sliver hazard, insuring long life and providing foot traction in all directions. The floor is handsome, quiet, stays smooth and is inherently non-slip. Physical directors say that the "feel" of a Bloxonend floor is remarkable.

Leading Industrialists have found that cold, stone-hard floors are conducive to poor work because they put a brake on both mind and body. This is the reason such floors are seldom tolerated in manual training rooms. Wood is the preferred material and the trend is toward BLOXONEND because of its long life, resiliency, smoothness and cleanliness. The floor is non-sliver and non-slip. Its use prevents damage to tools accidentally dropped.

Write for Booklet

Nearly all nationally known school architects specify BLOXONEND. Our Booklet "School Floors" gives details of construction, contains specifications for laying and illustrates representative installations in gyms and shops. Write for a copy.



Our experience indicates 12" o.c. floor strips afford ample resiliency. Wider spacing optional.